Newsletter

of the EPPO Network of experts working on surveillance, monitoring, and control of the Emerald ash borer, *Agrilus planipennis*

No. 9 **Paris, 2025-12**

Contents of the Newsletter

Photo of *Agrilus planipennis* above: Courtesy of Eduard Jendek.

The webpage of the Network:
https://www.eppo.int/RESOURCES/special_projects/agrilus_planipennis_network

1. Introduction

We are pleased to welcome readers to the 9th issue of the Newsletter of the EPPO Network of experts working on the surveillance, monitoring, and control of the Emerald ash borer, *Agrilus planipennis*. The Network was established by **the European and Mediterranean Plant Protection Organization (EPPO)** following a recommendation of its **Panel on Quarantine Pests for Forestry**. It was created in association with an EPPO-EU project and is supported by funding from the **European Union's Horizon Europe Research and Innovation Programme** under grant agreement No. 101134200, *FORSAID: Forest surveillance with artificial intelligence and digital technologies*. As of December 2025, the Network brings together **more than 320 members from over 45 countries**, reflecting strong and growing international collaboration. We warmly encourage readers to invite colleagues to join the Network via the following link: https://forms.office.com/e/7GxvJkS0YT.

The **EPPO Secretariat** invites participants to share relevant information and updates with the Network Coordinator (Dmitrii Musolin, dm@eppo.int).

2. The Emerald ash borer is now in Belarus. Where next?

From 2018 to 2025, regular comprehensive surveys of *Fraxinus pennsylvanica* and *F. excelsior* were conducted in three administrative regions (Vitebsk, Lyozna, and Orsha) in the north-eastern part of Belarus. No signs or symptoms of *A. planipennis* were detected in urban or peri-urban plantings in these regions, nor along the railways and highways connecting these cities with the Smolensk and Bryansk regions of the neighbouring country — the Russian Federation. Considering the heavy infestation of ash trees in Smolensk and Bryansk, as well as the continuous presence of *F. pennsylvanica* and *F. excelsior* in shelterbelts along major roads in both the Russian Federation and Belarus, it was assumed that these shelterbelts could serve as potential 'green corridors' facilitating the spread of emerald ash borer into Belarus.

In late **June 2025**, ***A. planipennis* was detected in Gomel**, a city located in south-eastern Belarus. This city lies much further south than the three administrative regions (Vitebsk, Lyozna, and Orsha), where the pest's occurrence had previously been expected (Fig. 1A).

The distance between Gomel and Orsha, the nearest location where the infestation was expected, is approximately 230 km in a straight line, or about 280 km by roads.

In an urban area of Gomel, a total of 46 ash trees — 39 *F. pennsylvanica* and 7 *F. excelsior* were examined. They all had characteristic symptoms, including canopy dieback, epicormic shoots, D-shaped exit holes, and larval galleries under the bark (Fig. 1B-C). Twenty nine (63%) of these trees were already in severe decline and a dozen adult beetles were observed feeding and mating on ash leaves. Some beetle specimens (Fig. 1D-E) were collected for further molecular genetic analysis. Notably, most infested trees were located along or near railway tracks, whereas no signs of *A. planipennis* were found in the peri-urban areas of Gomel or along highways coming from the Russian and Ukrainian borders.

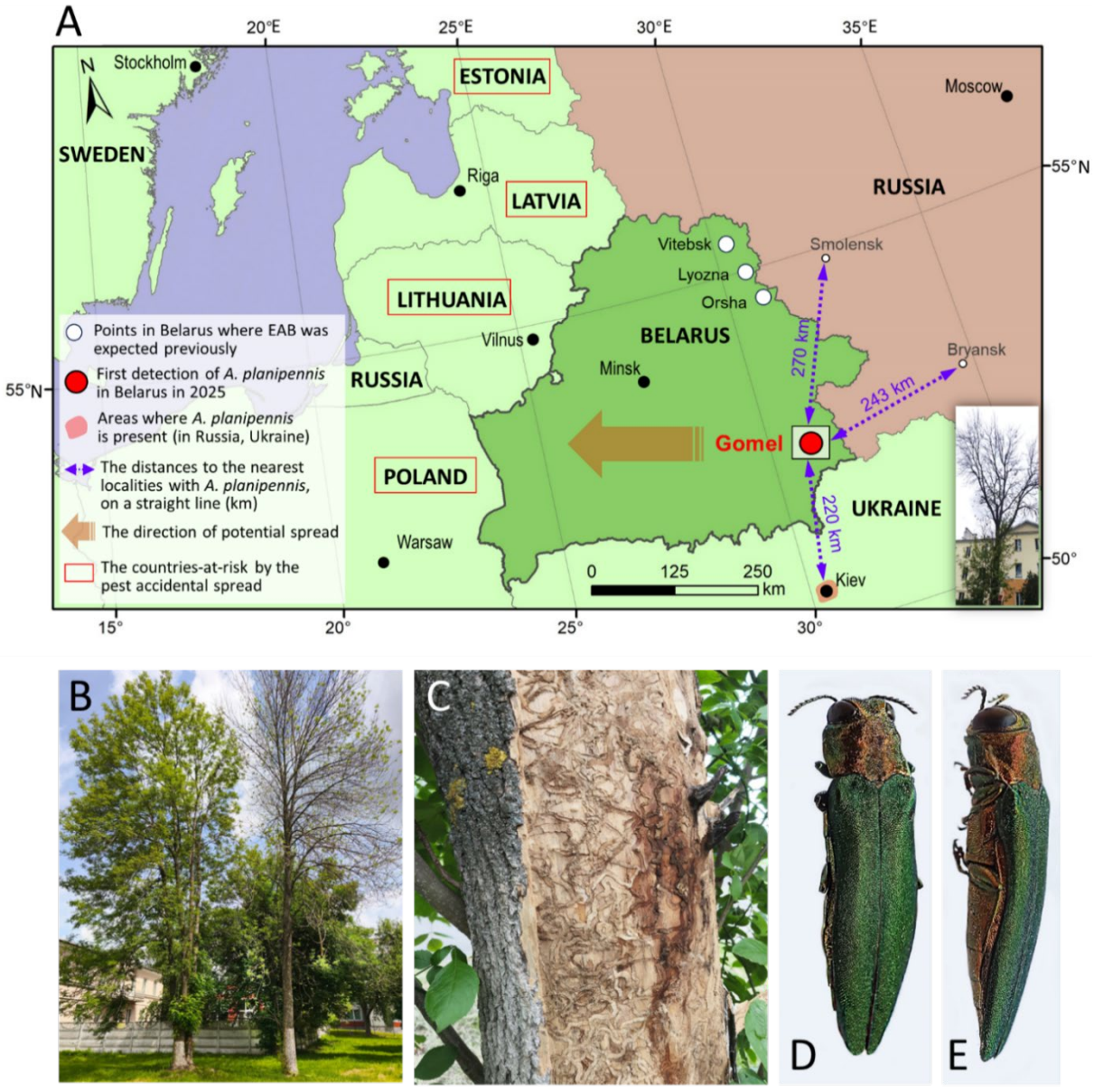


Figure 1. The detection of *Agrilus planipennis* in Belarus, July 2005. A — the potential donor regions of the pest to Belarus and the countries most directly at risk; B — infested tree of *Fraxinus pennsylvanica* in Gomel; C — dense larval galleries under the bark; D—E — the beetle (dorsal and lateral views) (modified from Zviagintsev et al., 2025).

The nearest previously documented infestations of *A. planipennis* to Gomel are located in Bryansk (243 km away) and Smolensk (270 km), Russia, and in Kyiv (220 km), Ukraine (Fig. 1A). All these areas could potentially serve as sources for the pest's introduction into Belarus. However, given that transport connections between Belarus and Ukraine were suspended in February 2022, it is most likely that the pest was accidentally transported from Russia. Indeed, Gomel is connected to Bryansk Region (Russia) via railway and roads, with a distance of about 243 km between these regions in a straight line. This hypothesis requires further investigation.

If *A. planipennis* continues spreading in Belarus, **it may reach neighbouring countries such as Lithuania, Latvia, and Poland**. The pest could also spread to Latvia and Estonia from adjacent Russian territories (Fig. 1A). Further distribution is expected to result primarily from unintentional human-mediated transport rather than natural dispersal. Consequently, occurrence of sudden foci in locations distant from the pest's current front can be expected.

The study was performed with the support of the Russian Science Foundation (RSF), grant No. 22-16-00075-P.

Read more:

Zviagintsev VB, Kirichenko NI, Chernik MI, Seraya LG, Baranchikov YN (2025) The Emerald ash borer *Agrilus planipennis* Fairmaire (Coleoptera: Buprestidae) invaded Belarus. *Acta Biologica Sibirica* 11: 847–861. https://doi.org/10.5281/zenodo.16744135

(prepared by **Natalia I. Kirichenko**, **Yuri N. Baranchikov,** Sukachev Institute of Forest SB RAS, Federal Research Center "Krasnoyarsk Science Center SB RAS", Krasnoyarsk, Russia; **Vyacheslav B. Zviagintsev**, Belarusian State Technological University, Minsk, Belarus)

A note from the EPPO Secretariat:

The NPPO of Belarus recently informed the EPPO Secretariat that the delimiting surveys were finalized, and a quarantine area has been established. It covers 50.11 ha in the Sovetskiy district and 129.14 ha in the Zheleznodorozhniy and Centralniy districts of Gomel city. Eradication measures are implemented. The NPPO underlines that the Belarus currently does not export any ash timber and that the forest area with ash trees is only 0.16% of the total forest area.

The pest status of *A. planipennis* in Belarus is officially declared as: **Present, not widely distributed (outbreaks of pest in Gomel) and under official control**.

Source: NPPO of Belarus (2025-11); EPPO RS 2025/208.

3. The Emerald ash borer keeps spreading in Southern Russia

We present an overview of the continuing spread of *Agrilus planipennis* in **the southernmost part of Russia**, which includes two administrative regions: the Southern Federal District (best known for the resort areas in/around Sochi in the Krasnodar Territory) and the North

Caucasian Federal District (which includes several Caucasian republics such as Chechnya, Dagestan, Kabardino-Balkaria, and Karachay-Cherkessia, as well as the Stavropol Territory).

In the Southern Federal District, *A. planipennis* was for the first time recorded in **2021** in the city of Azov, Rostov Region (Orlova-Bienkowskaja & Bieńkowski, 2022). In the following years (2022–2024), infestation and dieback of ash trees were observed in various parts of this region (Romanchuk et al., 2022; Kasatkin and Meshcheryakova, 2024).

In 2022, *A. planipennis* was detected in the northern part of the Krasnodar Territory (Shchurov and Zamotaylov, 2022). By the end of that year, outbreaks were documented over an area of 1 700 ha in the Kanevsky and Ust-Labinsky district forests (Shchurov and Zamotaylov, 2023).

In 2023, the pest reached the Kuban River valley where it was recorded in the cities of Krasnodar and Kropotkin (Shchurov and Zamotaylov, 2024). Further north, during the same year, dieback of ash stands accompanied by the formation of stump sprouts was reported (Shchurov and Zamotaylov, 2024).

In January 2023, *A. planipennis* was found for the first time in **the North Caucasian Federal District**, specifically in the city of Stavropol (Zhuravleva and Karpun, 2023). Later, in October 2023, it was also detected in Pyatigorsk (Baranchikov and Ponomarev, 2024).

In June 2025, a large-scale study was conducted across five administrative regions of **Southern Russia**: one in the Southern Federal District (Krasnodar Territory) and four in the North Caucasian Federal District (Stavropol Territory and the Republics of Kabardino-Balkaria, Karachay-Cherkessia, and Adygea) (Karpun and Kirichenko, 2025). The survey route covered 1 880 km, with the distance between the westernmost point (Elizavetinskaya Station, Krasnodar Territory) and the easternmost point (Nalchik, Kabardino-Balkaria) amounting to 520 km by road and 421 km in a straight line. Planted areas, i.e., urban plantings, parks, and botanical gardens, as well as roadside and field-protective belts, composed of *Fraxinus pennsylvanica* and *F. excelsior*, were examined in 37 locations in 34 settlements.

The following infestation indicators were taken into account: crown thinning, tree-top dieback, abundant trunk shoots, and, as a key diagnostic feature, the presence of characteristic D-shaped exit holes in the bark. Whenever possible, bark was peeled off to inspect larval galleries and collect immature specimens. In public areas and botanical gardens, tree examination was carried out with prior authorization from the relevant institutions.

As a result of this survey, much new data were obtained (Karpun and Kirichenko, 2025). For the first time, *A. planipennis* was documented in the Republic of Karachay-Cherkessia, in Oktyabrsky village, near the Mineralnye Vody–Cherkessk highway (Fig. 1).

In addition, several new infestation foci were identified across other surveyed regions. In the Stavropol Territory, *A. planipennis* was recorded in four localities within Mineralnye Vody, a protected resort area of the North Caucasus (Fig. 1). In the Krasnodar Territory, it was found in five new localities, including the first record in the urban plantings ofKrasnodar city, specifically in the Botanical Garden of the Kuban State Agrarian University.

No signs of *A. planipennis* were detected in the Republics of Kabardino-Balkaria or Adygea. However, it is suspected that the pest may already be present there at very low population densities, with no visible symptoms yet observed.

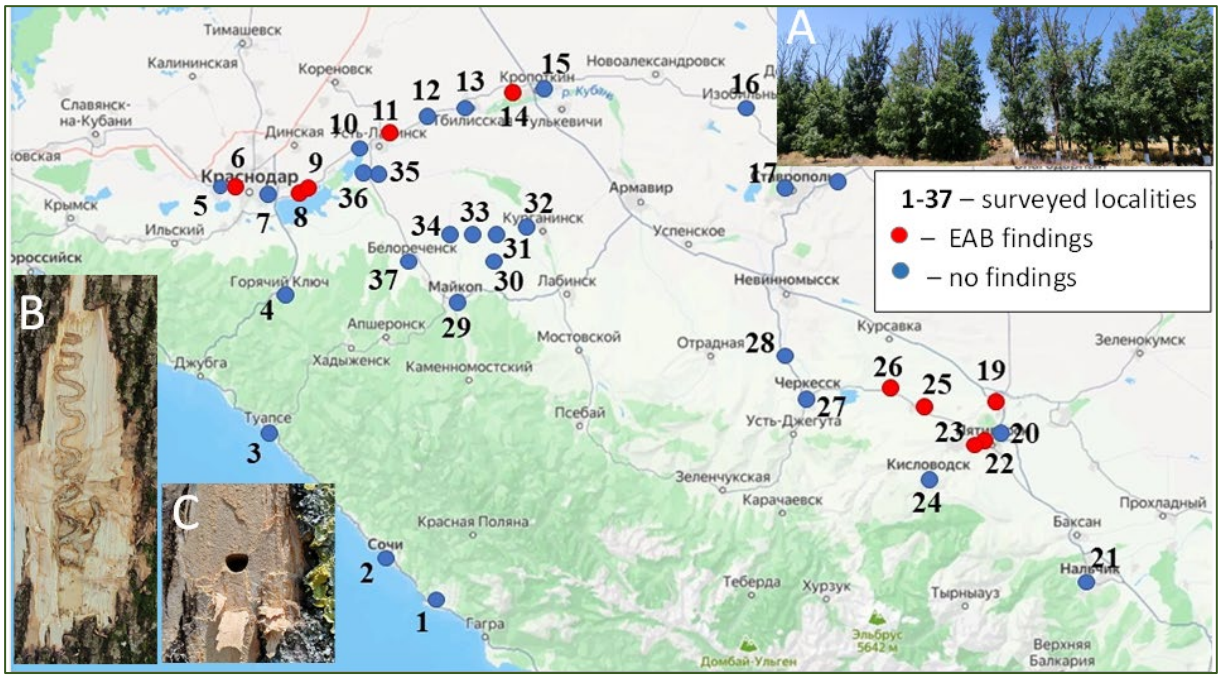


Figure 1. Study area in Southern Russia showing the points where *Agrilus planipennis* was detected in July 2025. Numbers indicate the order in which the locations were surveyed. The pest was detected in the following locations: in Krasnodar Krai: 6 — Krasnodar, Botanical Garden of Kuban State Agrarian University, 8, 9 — vil. Starokorsunskaya, 11 — Ust-Labinsk, 14 — vil. Kazanskaya; in Stavropol Krai: 19 — Mineralnye Vody, 22, 23 — Yessentuki, 25 — vil. Suvorovskaya; in the Republic of Karachay-Cherkessia: 26 — vil. Oktyabrsky. A — declining ash trees in a shelter belt along the route 'Krasnodar—Kropotkin'; B—C — characteristic larval gallery and D-shaped exit hole, Krasnodar Territory (modified from Karpun and Kirichenko, 2025).

In summary, seven of ten detected infestation foci were located in shelterbelts and roadside plantings, while two foci were found in city parks and one in a botanical garden. In some cases, ash dieback caused by *A. planipennis* extended for over 10 km along roads. Both ash species were affected. In a tree belt near the resort city of Yessentuki, a severe infestation of *F. excelsior* was recorded. The majority of damaged trees of both species were over 50 years old, with a single exceptional case of infestation observed on a young tree less than 10 years old. These findings clearly indicate that ***A. planipennis* is likely to continue spreading throughout the North Caucasus** unless effective management measures are implemented.

The study was performed with the support of the Russian Science Foundation, grant No. 22-16-00075-P.

(prepared by **Natalia I. Kirichenko**, Sukachev Institute of Forest SB RAS, Federal Research Center 'Krasnoyarsk Science Center SB RAS', Krasnoyarsk, Russia; **Natalia N. Karpun**, Federal Research Centre the Subtropical Scientific Centre of the Russian Academy of Sciences, Sochi, Russia)

References

Baranchikov YN, Ponomarev VI (2024) The emerald ash borer (*Agrilus planipennis* Fairmaire, 1888) has reached the Caucasus. *Promishlennaya Botanika* 24(1): 69–72 (in Russian) https://doi.org/10.5281/zenodo.10845636

Karpun NN, Kirichenko NI (2025) New records of the Emerald ash borer *Agrilus planipennis* Fairmaire (Coleoptera: Buprestidae) in the southern European Russia. *Plant Protection News* 108 (4) (in Russian) https://doi.org/10.31993/2308-6459-2025-108-4-17427

Kasatkin DG, Meshcheryakova IS (2024) New data on the distribution and impact of *Agrilus planipennis* (Coleoptera: Buprestidae) in the Rostov region. *Fitosanitariya. Karantin Rastenii* S4-1 (20): 36. (in Russian)

Orlova-Bienkowskaja MJ, Bieńkowski AO (2022) Southern range expansion of the Emerald ash borer, *Agrilus planipennis*, in Russia threatens ash and olive trees in the Middle East and Southern Europe. *Forests* 13: 541. https://doi.org/10.3390/f13040541

Romanchuk RV, Meshcheryakova IS, Poushkova SV, Kasatkin DG et al. (2022) The distribution of the emerald ash borer *Agrilus planipennis* (Coleoptera: Buprestidae) in the south of the Rostov region. *Ekosystemy* 32: 33—41. (in Russian)

Shchurov VI, Zamotaylov AS (2022) The first findings of the Emerald ash borer *Agrilus planipennis* Fairmaire, 1888 (Coleoptera: Buprestidae) in Krasnodar region. Proc. XXIV Int. Scientific Conf. 'Biological Diversity of the Caucasus and Southern Russia'. 558-565. (in Russian)

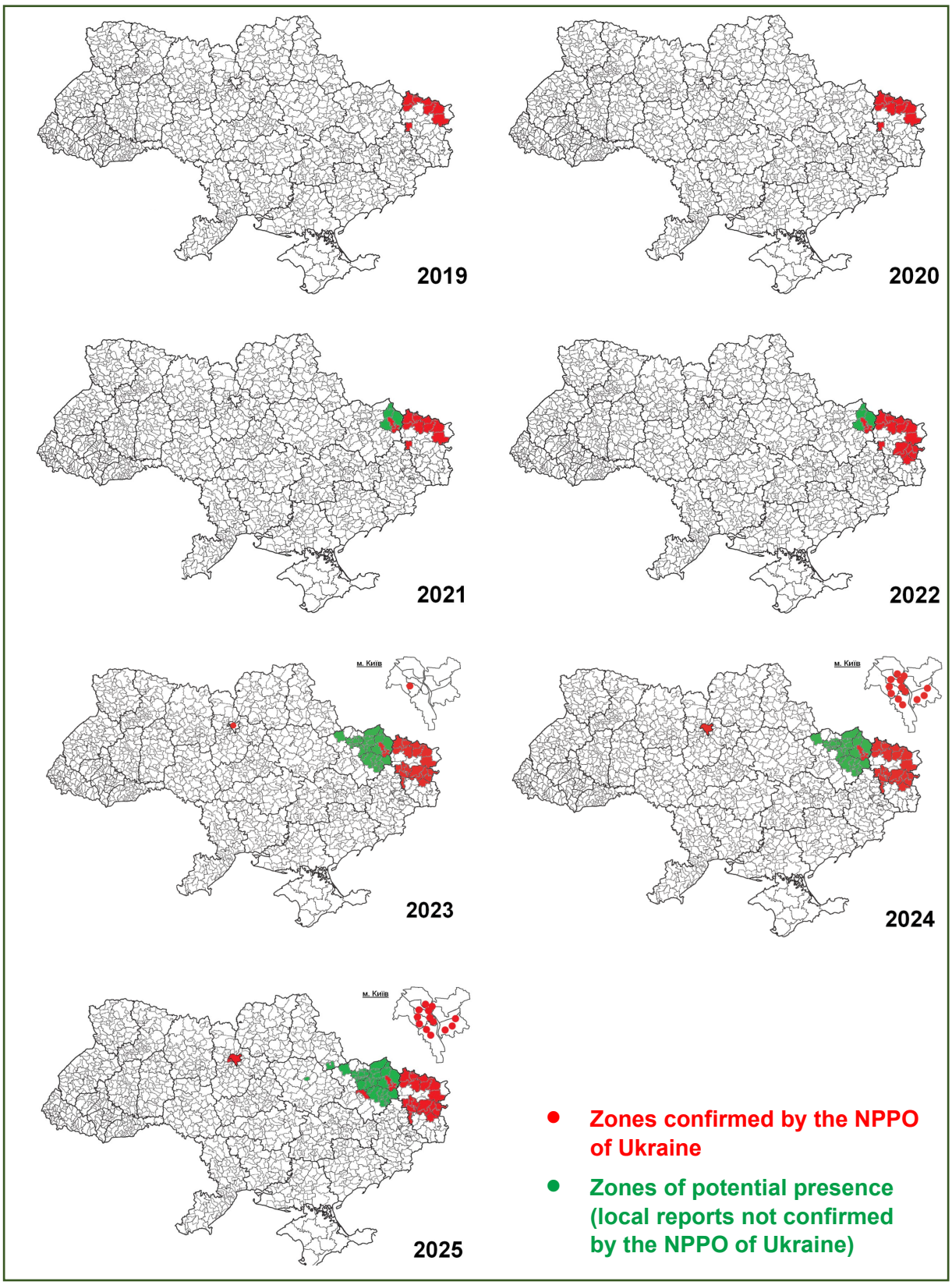
Shchurov VI, Zamotaylov AS (2023) Monitoring of the ash stands (Oleaceae: *Fraxinus*) in modern foci of *Agrilus planipennis* Fairmaire, 1888 (Coleoptera: Buprestidae) in the West Caucasus (2007—2023). Proc. XI Int. scientific and practical conf. 'Protection of plants from harmful organisms'. 453—456. (in Russian)

Shchurov VI, Zamotaylov AS (2024) Dynamics of the most important invasions of dendrophilous insects (Insecta: Heteroptera, Coleoptera, Hymenoptera, Lepidoptera) in the Krasnodar territory over 25 years. *Fitosanitariya. Karantin Rastenii* S4-2(20): 94—95. (in Russian)

Zhuravleva YeN, Karpun NN (2023) The first discovery of the emerald ash borer (*Agrilus planipennis* Fairmaire) in Stavropol. *Subtropicheskoe i Dekorativnoe Sadovodstvo* 85: 169—178. (in Russian) https://doi.org/10.31360/2225-3068-2023-85-169-178

4. A dynamic map of distribution of *Agrilus planipennis* in Ukraine: an update for 2025

In 2025, the Ukrainian State Specialized Forest Protection Enterprise DS LP "Kharkivlisozakhist" updated **a dynamic map** showing the change of the range of *A. planipennis* in Ukraine in 2025 (https://lisozahyst.at.ua/index/agrilus-planipennis/0-17). The map (see the next page) now shows not only districts where the presence of the pest is confirmed by the NPPO, but also districts with local reports that are not yet confirmed by the NPPO. Please note that in 2026 the map will be moved to a new site of the enterprise (https://www.kharkivlisozahyst.gov.ua/).



The dynamics of the invasive range of *A. planipennis* in Ukraine in 2019–2025 (Courtesy: The Ukrainian State Specialized Forest Protection Enterprise DSLP "Kharkivlisozakhist"; units: administrative districts; for 2023–2025, an insert for Kyiv is added. https://lisozahyst.at.ua/index/agrilus-planipennis/0-17; accessed on 15 December 2025).

5. Demarcated areas for *Agrilus planipennis* in the Russian Federation in 2024

As of 2024, *Agrilus planipennis* is officially **reported in 20 regions** (federal subjects) of the Russian Federation (the National report on phytosanitary quarantine status of the territory of the Russian Federation for 2024). A year earlier (2023), this regulated pest was reported in 10 regions (federal subjects) in the country (the National report for 2023). Delimiting surveys will continue in the Russian Federation in the framework of the national surveillance system.

The total area of **demarcated zones** is reported to be 11 836 660 ha in 2024 (it was 2 752 490 ha in 2023). The relevant information on demarcated zones for 2024 is available in the National report on phytosanitary quarantine status of the territory of the Russian Federation and in the set of open access information of the NPPO of the Russian Federation.

A summary of the 2024 update on the situation of quarantine pests in the Russian Federation is available in the EPPO Reporting Service article # 2025/255.

(prepared by **Maria Yerokhova,** All-Russian Phytopathology Research Institute, Moscow Region, Russia)

6. New molecular test for the Emerald ash borer

The legal status of *Agrilus planipennis* as a priority quarantine pest under the EU Plant Health Regulation requires all Member States to conduct intensive annual surveys. Recommended measures include visual inspections, pheromone traps, and molecular diagnostics in accordance with the EPPO Standards PM 7/154(1) *Agrilus planipennis* and PM 9/14(1) *Agrilus planipennis*: procedures for official control.

Sorting *Agrilus* specimens collected during 2025 surveillance, prepared for qPCR.

Analysing qPCR validation results.

The multiplex TaqMan qPCR published by Kupper et al. (2025) enables **rapid, highly sensitive detection** of *A. planipennis*. The method has been validated for various sample types, including adult insects, larvae, eggshells, frass, faeces, and environmental DNA from leaf surfaces. An internal control (28S rDNA) verifies DNA is amplifiable. This is critical in complex matrices prone to degradation or PCR inhibition. The test was specific to *A. planipennis* and no other tested species showed amplification and sensitivity, allowing the method to supplement existing molecular diagnostic protocols. The test enables precise identification even with very small amounts of DNA, supporting legally required surveys and faster response times in the event of an infestation.

Ongoing projects in the phytopathology group at the Swiss Federal Institute for Forest, Snow and Landscape Research (WSL) are validating the method for environmental samples from various matrices. Future efforts may include additional multiplexing capabilities for simultaneous detection of multiple invasive *Agrilus* species.

Read more:

Kupper Q, Peterson DL, Fritsi LC, Hölling D, Perret-Gentil A, Pecori F, Altenbach D, Giulio, Zbinden H, Schneider S, Ruffner B (2025) An enhanced qPCR method for rapid *Agrilus planipennis* detection and monitoring. *NeoBiota* 103, 53–67. https://doi.org/10.3897/neobiota.103.163040

(prepared by **Beat Ruffner,** Swiss Federal Research Institute for Forest, Snow and Landscape, Switzerland; photos by Phytopathology Group, WSL)

7. Contingency plans for *Agrilus planipennis* in EPPO Member Countries

In issues # 7 and 8 of the Newsletter, links to the publicly available **contingency plans** for *Agrilus planipennis* were given for several countries. Since then, members of the Network sent information on the contingency plans for France and Germany.

Please let us know if similar plans are available for other countries of the EPPO region.

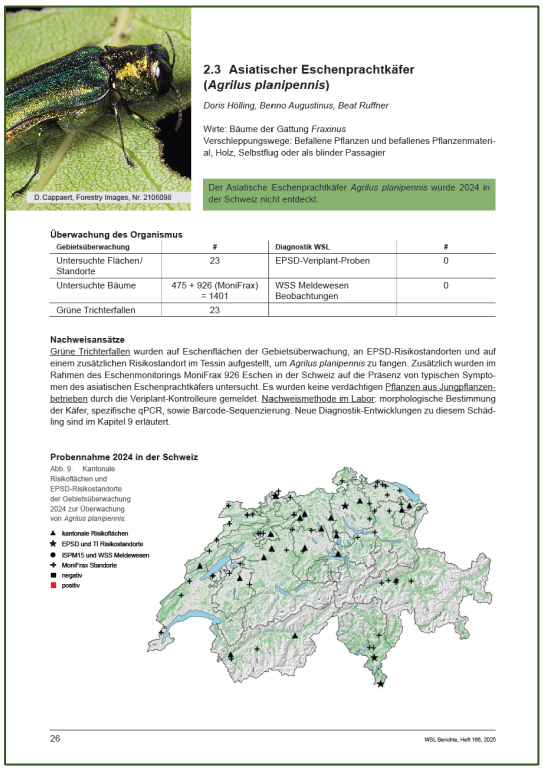
The EPPO Secretariat reminds our readers of the relevant Standards PM 9/10(1) Generic elements for contingency plans and PM 9/14 (1) *Agrilus planipennis*: procedures for official control.

8. Swiss report on surveillance of organisms particularly harmful to forests: *Agrilus planipennis* and *A. anxius* were not recorded

The Swiss Federal Institute for Forest, Snow and Landscape Research (WSL) published an annual report for 2024 '**Surveillance of organisms particularly harmful to forests**'.

The current Plant Health Ordinance has been in force in Switzerland since January 2020. It regulates the handling of particularly dangerous harmful organisms. In 2024, the risk of pest entry was monitored at 53 sites in different cantons of the country and at Zurich Airport (ZH), at the Rhine port of Birsfelden (BL) and near the national border in Chiasso (TI). During the surveys in plant nurseries, susceptible host plants were checked for quarantine organisms and regulated non-quarantine organisms and suspect samples were analyzed. In addition, suspect samples from import controls of packaging wood and from the reporting system of Swiss Forest Protection were examined. In 2024, a total of 2 061 samples underwent molecular tests for forest-relevant harmful organisms in the diagnostics laboratory.

In addition, more robust and alternative methods for the diagnosis of specific harmful organisms (including *A. planipennis* and *A. anxius*) were established and validated.



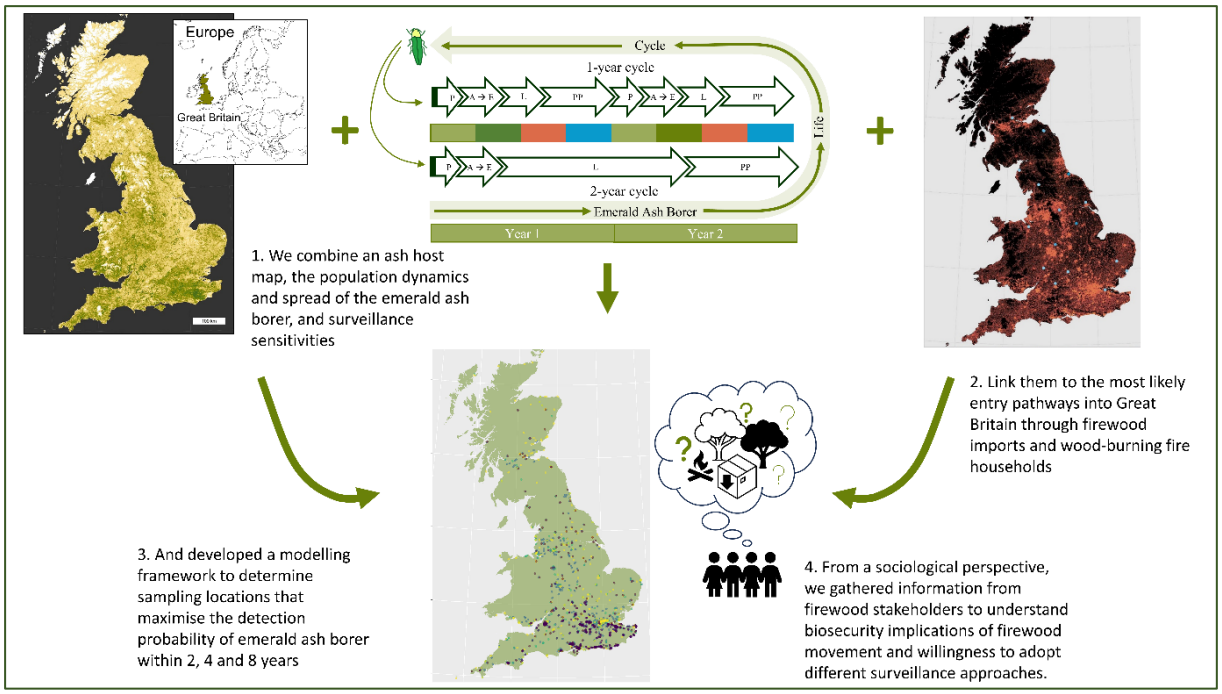
The monitoring was focused, among other pests, on *Agrilus planipennis* and *A. anxius*. These **two pests were not found** during the surveys and inspections carried out in 2024.

Read more:

Prospero S, Hölling D, Orbach J, Ruffner B, Dubach V, Beenken L, Stroheker S, Cornejo C, Kupper Q, Augustinus BA, Brockerhoff E, Gossner MM, Bächli A, Queloz V (2025) Überwachung von besonders gefährlichen Schadorganismen für den Wald – Jahresbericht 2024. (Surveillance of organisms particularly harmful to forests – Annual report 2024). WSL Ber. 166. 60 S. https://www.wsl.ch/de/publikationen/ueberwachung-von-besonders-gefaehrlichen-schadorganismen-fuer-den-wald-jahresbericht-2024/

9. Early detection strategies for *Agrilus planipennis*: Targeted surveillance and stakeholder perspectives

To address the threat of *Agrilus planipennis* arriving in Great Britain, a **modelling framework** was developed that integrates ash tree distribution, potential invasion pathways, and *A. planipennis* population dynamics to develop optimised sampling strategies designed to maximise the early detection of this pest. The study also incorporated stakeholder perspectives by surveying landowners and firewood importers to gauge their willingness and potential involvement in surveillance efforts, recognizing human activity, such as transporting firewood, as a primary vector for the Emerald ash borer spread.



A graphical abstract of the paper (Alonso Chávez et al., 2025).

Imported firewood from Eastern Europe was identified as a likely entry point for *A. planipennis* into Great Britain, highlighting the importance of monitoring areas around ports, and firewood depots. To account for the pest's entry pathways uncertainty, households using wood-burning fires were considered as points of potential spread. The study found that while optimising for detection within an 8-year timeframe increases the probability of the Emerald ash borer discovery, prioritising detection of the pest earlier (e.g. within 2—4 years of its arrival), even with lower initial probabilities, significantly improves the chances of eradication. Furthermore, increasing the certainty of *A. planipennis* entry points, for example, through heightened biosecurity awareness, improves detection rates.

Despite a general awareness of biosecurity among firewood importers, the study noted that **uncertainty over overseas biosecurity practices may present a potential risk**. Some stakeholders also expressed a sentiment that further precautions were futile due to the high prevalence of ash dieback in Great Britain.

This study provides the first surveillance map for *A. planipennis* incursions in Great Britain, offering a valuable tool for government agencies to optimise surveillance locations.

Read more:

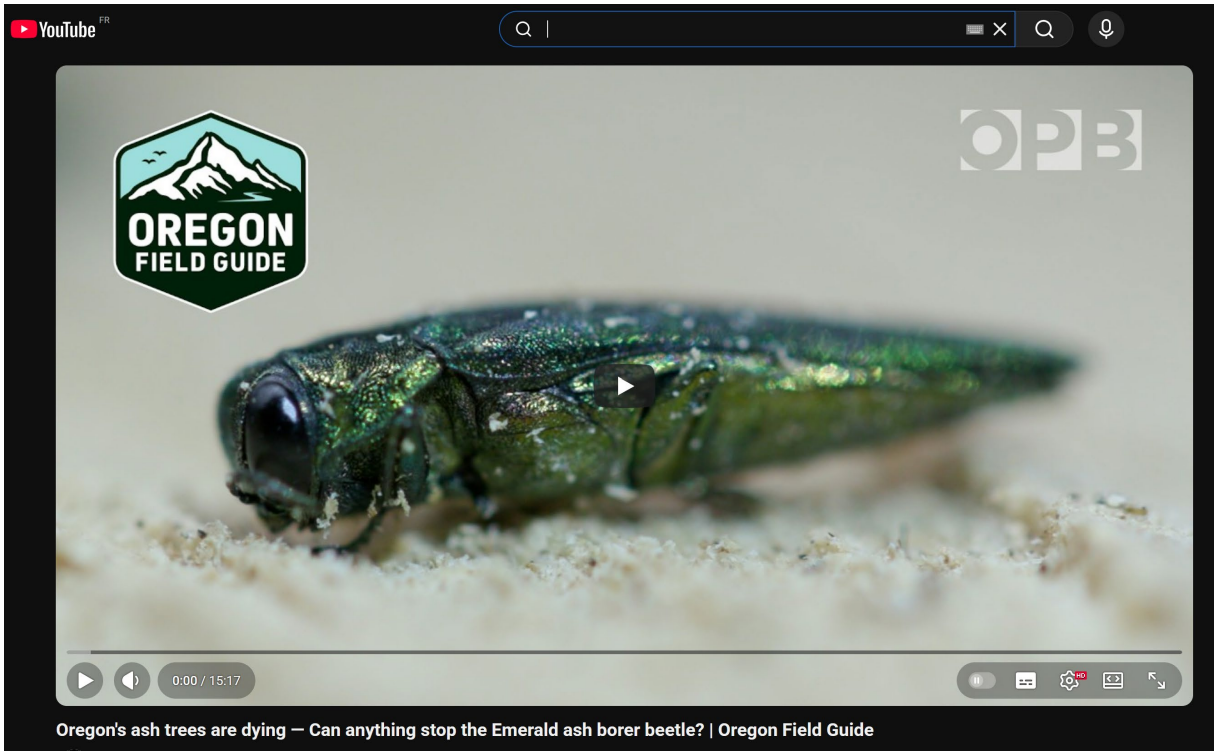
Alonso Chávez V, Brown N, van den Bosch F, Parnell S, Dyke A, Hall C, Karlsdottir B, Marzano M, Morris J, O'Brien L, Williams D, Milne AE (2025) Early detection strategies for invading tree pests: Targeted surveillance and stakeholder perspectives. *Journal of Applied Ecology*, 62, 857—871. https://doi.org/10.1111/1365-2664.70009

(prepared by **Vasthi Alonso Chávez**, Rothamsted Research, GB)

10. *Agrilus planipennis*: Updates from the USA

In November 2025, the **Mississippi Forestry Commission** confirmed **the first detection** of Emerald ash borer **in Mississippi**: https://www.mfc.ms.gov/2025/11/mfc-confirms-first-detection-of-emerald-ash-borer-in-mississippi/

Oregon Field Guide published a story on the state's response to *Agrilus planipennis* in Oregon. You can view the 15 min story online at 'Oregon's ash trees are dying — Can anything stop the Emerald ash borer beetle?' https://www.youtube.com/watch?v=sYJ44_vh8iw.



11. Two new EFSA Pest reports to support the ranking of EU candidate priority pests: *Agrilus planipennis* and *A. anxius*

In 2022, EFSA was mandated by the European Commission's Directorate-General for Health and Food Safety (M-2022-00070) to provide technical assistance on the list of Union quarantine pests qualifying as priority pests, as specified in Article 6(2) of Regulation (EU) 2016/2031 on protective measures against plant pests. As part of Task C, EFSA conducted expert knowledge elicitations for candidate priority pests, focusing on the lag period, expansion rate and the impact on production (yield and quality losses) and the environment.

In 2025, **two reports** that provide the rationale for the dataset on ***Agrilus planipennis*** and ***A. anxius*** delivered to the European Commission's Joint Research Centre, were published to

feed into the Impact Indicator for Priority Pests (I2P2) model and complete the pests' prioritisation ranking exercise.

Read more:

EFSA (European Food Safety Authority), Tramontini S, Gilioli G, Antoniou A, Rzepecka D, Pennacchio F, Binazzi F, Krusteva R, Scala M, Sánchez B, Nougadère A, Vos S (2025) *Agrilus anxius* — Pest Report to support the ranking of EU candidate priority pests. EFSA supporting publication 2025: 22(4): EN-9433. 30 pp. https://doi.org/10.2903/sp.efsa.2025.EN-9433

EFSA (European Food Safety Authority), Tramontini S, Gilioli G, Barbieri F, Paoli F, Rzepecka D, Antoniou A, Krusteva R, Scala M, Sánchez B, Nougadère A, Vos S (2025) *Agrilus planipennis* — Pest Report to support the ranking of EU candidate priority pests. EFSA supporting publication 2025: 22(4): EN-9432. 46 pp. https://doi.org/10.2903/sp.efsa.2025.EN-9432

12. The first annual meeting of the FORSAID Project which supports the Network and its regular Newsletter

Project FORSAID started in September 2024 after receiving support from the **European Union's Horizon Europe Research and Innovation Programme** under grant agreement No. 101134200, ***FORSAID: Forest surveillance with artificial intelligence and digital technologies***.

The overall **objective of FORSAID** is to incorporate novel digital solutions in the fight against forest pests in Europe. In this sense, the project is working to build up and firmly establish a novel and comprehensive paradigm for identifying, observing and containing pest proliferations across Europe. Specifically, several EU-regulated pest species that have a particularly substantial negative impact on plant health (including ***Agrilus planipennis*** and ***A. anxius***) are being targeted.

The first annual meeting in progress.

One year after FORSAID's official kick-off, the project's consortium gathered for **its first annual meeting**. Representatives from all 17 participating institutions came together in the

Portuguese city of Carcavelos between the 11th and 13th of September 2025. They were joined by all members of the FORSAID Advisory Board, the project's assigned officer from the European Commission and a number of stakeholders from across Europe who participated in a virtual capacity.

The meeting was hosted by the National Institute for Agricultural and Veterinary Research (INIAV) and the University of Lisbon's School of Agriculture (ISA), working in tandem with the coordination team from the University of Padua (UNIPD) on a comprehensive, inclusive and informative agenda for all attendees.

Project partners provided updates on the progress achieved over the past year. Extended sessions on the following work packages (WP) gave the spotlight to FORSAID's research tasks:

- WP2 — Remote sensing of forest damage
- WP3 — Digital technologies for ground detection and surveillance of regulated pests
- WP4 — Citizen science
- WP5 — Deployment strategy with stakeholders

An overview was also given on how both the project's coordination and management (WP1) and its communication, dissemination and exploitation activities (WP6) have evolved so far. Dmitrii Musolin (EPPO) informed the participants about activity of **the Network** and its regular **Newsletters**, preparation of which is supported by this project.

In addition to the active discussion on present challenges and future opportunities participants were given practical demonstrations of two of the innovative solutions that are being developed by FORSAID researchers. One was the **Entomoscope** photo-microscope and its software by the Karlsruhe Institute of Technology (KIT), which is used for imaging and identifying specimens of insects that are categorised as forest pests. The other was a **spectroscopy device** for detecting the presence of the pine wood nematode *Bursaphelenchus xylophilus* in pine needle samples.

Adult beetle *Agrilus* sp. under Entomoscope.

Agrilus planipennis is among nine target species of the project.

The annual meeting was an important forum for sharing insights, evaluating achievements and reaffirming partnerships for the next stages of FORSAID's implementation.

More information on the project can be found at the homepage of FORSAID and in its regular Newsletter.

(prepared based on the information and photos from the website of FORSAID)

13. EABRACE Workshop 'First Year of Baltic Co-partners' Experience': Researchers and authorities met in Krakow to fight the Emerald ash borer

On 16th to the 17th of October 2025, 50 participants from 16 countries attended the **'EABRACE Workshop - First Year of Baltic Co-partners' Experience'** held at the University of Agriculture in Krakow, Poland. The event was organized within the framework of the EABRACE project, funded by the SLU Forest Damage Centre and the Swedish Institute.

The EABRACE project focuses on **monitoring** of *Agrilus planipennis* and evaluating the **biodiversity of beetles** before and during the invasion. The workshop is an important part of strengthening international cooperation on monitoring, control and research coordination of the species in the **Baltic States**, as well as creating a platform for joint learning and method development to protect Europe's ash tree population. The project brings together researchers and representatives of **National Plant Protection Organizations (NPPOs)** from **Latvia, Lithuania, Poland, Sweden** and **Ukraine.**

Participants of the workshop.

Jaroslaw Socha (University of Agriculture in Krakow) welcomed all participants and emphasized the importance of collaborative initiatives across neighbouring countries against the spread of invasive species and to protect forest ecosystems.

Iryna Matsiakh, project leader for EABRACE, overviewed the project's activities during the year and the initial results from the partner countries. During the meeting, the group also had the opportunity to discuss the methodological aspects of the project with the project's external entomologist **James Connell**, with valuable contributions from **Lukas Mayer**, Director of the company WITASEK (Germany).

International perspectives on the emerald beetle and forest health

Several guest speakers enriched the workshop and contributed to valuable knowledge exchange and discussions. They shared their experiences in **monitoring** and practical **trapping methods**, as well as innovative monitoring approaches and the use of **robotic technology** for **species identification**. The workshop also addressed how **urban trees** and **botanical gardens** can serve as important sites for monitoring, how quarantine pests are detected, and how the Emerald ash borer affects forest beetle biodiversity. Other key topics included the interaction between the Emerald ash borer and ash dieback, new **modelling approaches**, and regional cooperation on field trials and control strategies.

In-depth insight into Ukraine's work against *A. planipennis*

One of the highlights of the workshop was when representatives from Ukraine, including experts from the State Enterprise ‘Forests of Ukraine’, State Forest Resources Agency of Ukraine and the State Service of Ukraine on Food Safety and Consumer Protection, shared their insights on the Emerald ash borer. Presentations by **Tetiana Kucheriavenko** and **Marta Kostetska** provided participants with unique information on the current spread of the borer in Ukraine, the development of local populations, damage to ash trees, and the quarantine measures implemented by official authorities since the pest was first detected in 2019.

Presentation of the Network.

Practical sessions

The first practical sessions was a technical session that addressed challenges in **trapping**, the rationale for using specific trap types, regulatory restrictions, and other factors that influence diagnostic workflows. The second was a microscopy session. The event concluded with a demonstration of **molecular field detection** of pests using the **LAMP method** within the framework of the Foundation for Strategic Research project, followed by a summary discussion that set the focus for future collaborative initiatives in the Baltic region.

Representatives from Baltic NPPOs (Latvia, Lithuania, Poland, Sweden, and Ukraine) had the opportunity to discuss their experiences with the Emerald ash borer surveillance and the testing of WITASEK traps within the EABRACE project. NPPOs from Finland and Estonia were also invited to join the discussion, helping to bring all initiatives together and create opportunities for shared learning and collaboration.

Lukas Mayer (Director of WITASEK), and Donnie Peterson (SLU) during the practical sessions.

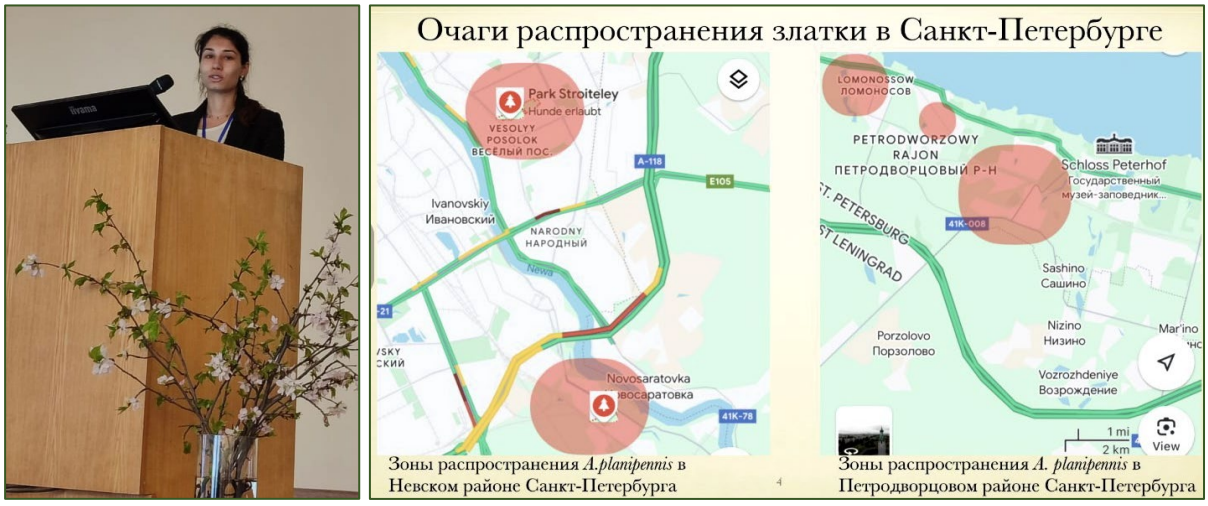
(prepared by **Iryna Matsiakh**, SLU, Sweden, SLU report)

14. Dynamics of population of *Agrilus planipennis* were discussed in two conferences in Russia

The IV International Conference '**Monitoring and Biological Control Methods for Woody Plant Pests and Pathogens: from Theory to Practice**' was held in Moscow (Russia) on the 7th—11th April, 2025. Several presentations mentioned the Emerald ash borer, and a presentation by Ilona **M. Kazi** and **Andrei V. Selikhovkin** focused on **outbreak of this pest in Saint Petersburg**. It was reported that presence of *A. planipennis* is recorded in several separate locations in Saint Petersburg; temperature and parasitoids play key roles in controlling population growth (which is still comparatively low), but increases in temperature associated with current climate change will likely stimulate population growth and, thus, mortality of ash trees in the region. Monitoring and control measures are critically important.

Read more:

Kazi IM, Ryss AY, Popovichev BG, Selikhovkin AV (2025) Formation of the invasive range of the Emerald ash borer *Agrilus planipennis* in St. Petersburg, Russia: Developmental characteristic, peculiarities and associated nematodes. *Biology Bulletin* 52:304. DOI: 10.1134/S1062359025610468



Ilona M. Kazi and a slide from her presentation at the conference in Moscow showing locations of sampled trees.

The second conference was held in Irkutsk (Russian) on 14—18 July 2025 and entitled '**Protecting Forests — Protecting the Future**'. At this meeting **Marina Y. Orlova-Bienkowskaja** used *Agrilus planipennis* as an example of pests in intercontinental complexes of insects associated with urban woody plants. She stressed that the invasion of the Emerald ash borer started in Russia in the urban environment and is only now spreading to forests. It is almost impossible to predict which species might form complexes of species under urban conditions, and the potential impact of these complexes are, thus, also unpredictable. In cities, the monitoring is needed not only for quarantine species but for all pests. Prompt and flexible responses are crucial.

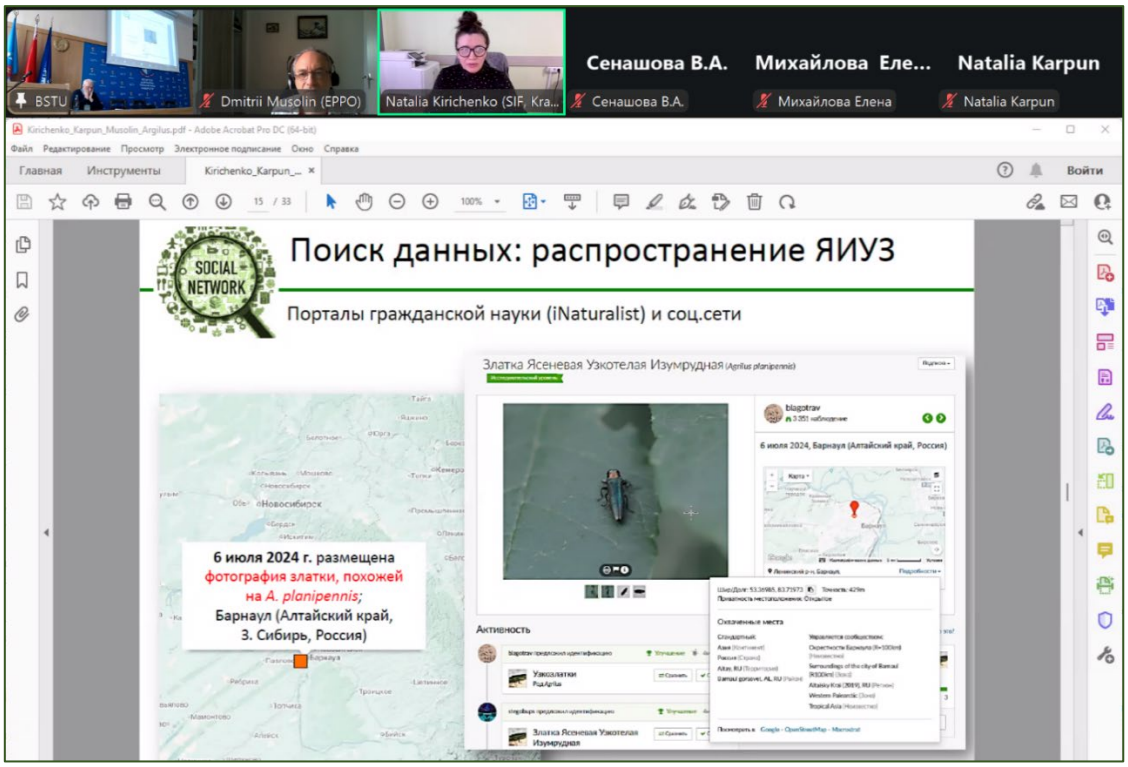
A slide from the presentation of Marina Y. Orlova-Bienkowskaja at the conference in Irkutsk illustrate composition of the complex of pests associated with ash trees in central Russia.

15. *Agrilus planipennis* was discussed as a new key quarantine pest at a conference in Minsk (Belarus)

The 12th International Scientific and Practical Conference **'Problems of Forest Phytopathology and Mycology'** dedicated to the 100th anniversary of the births of Professors N.I. Fedorov and V. I. Shubin was held in Minsk, Belarus, on the 13th–17th of October 2025. A special session was devoted to *Agrilus planipennis* and consisted of three talks.

Kirichenko NI, Musolin DL (2025) Large-scale study of the invasion of the tree-killer, the Emerald ash borer, in Eurasia: Invaluable input of citizen scientists and scientific community.

In this talk, the first results of the large-scale study aiming at the exploration of invasion genetics of the Emerald ash borer in Eurasia were presented. This project derived from an initiative within the Network was developed with involvement of citizen scientists and professional entomologists who provided samples of this pest from the invaded regions of Russia and North America and from its native area (south-east Asia). This collected material is used to explore the phylogeography of this pest, defining genetic diversity of different geographic populations in invaded *vs*. native range and invasive haplotypes that keep spreading westwards.



A slide from the presentation of Natalia Kirichenko in Minsk.

Kulinich OA, Ryaskin DI, Kozyreva NI, Arbuzova EN (2025) On the possible presence of the Emerald ash borer *Agrilus planipennis* Fairmaire on the territory of Belarus.

This presentation dealt with the distribution of *A. planipennis* in Russia. In early 2000s, the pest was first detected in Moscow, and in 2024 it was found in Altai. The mean speed of its spread was calculated to be about 120 km/year. Recently, the pest was detected in Kiev (Ukraine). The mean speed of its spread in the direction from Moscow to Kyiv was calculated as 36 km/year. The distance from Moscow to Minsk is almost identical to the distance to Kyiv and, therefore, it can be expected that *A. planipennis* may reach Minsk soon.

Zviagintsev VB, Kirichenko NI, Usenia VV, Pomaz GM, Chernik MI, Seraya LG, Baranchikov YN (2025) *Agrilus planipennis* Fairmaire (Coleoptera, Buprestidae) in Belarus: Possible vectors of invasion and prospects for the spread of the quarantine species.

In this talk, the presence of *A. planipennis* in Belarus was reported for the first time at scientific meeting. The pest was recorded in the city of Gomel[2]. It is stressed that urgent work is required to delineate the extent of its spread within Belarus. Moreover, decisive actions must be taken promptly to suppress the current infestation foci and prevent further distribution of this highly aggressive alien pest.

Proceedings of the conference:

Problems of Forest Phytopathology and Mycology: Proceedings of the 12th International Scientific and Practical Conference, Minsk, 13–17 October 2025. Edited by V.G. Storozhenko, V.B. Zvyagintsev, V.A. Yarmolovich. Minsk: Belarusian State Technological University, 2025. 290 p. https://conf.belstu.by/?page_id=19222

[2] See Section 2 of this Newsletter for details and the reference.

16. EPPO, FAO-REUFIS and BFW will organize a conference on emerging risks of *Agrilus* wood borers (Buprestidae)

EPPO FAO-REUFIS BFW Conference

'Safeguarding Forests in Europe: Emerging Risks of *Agrilus* Wood Borers (Buprestidae)'

Vienna, 21-23 April 2026

REGISTER NOW!

The Conference '**Safeguarding Forests in Europe: Emerging Risks of *Agrilus* Wood Borers (Buprestidae)**' will be organized in **BFW (Vienna) on the 21st-23rd of April 2026**. This is a joint event co-organized by the European and Mediterranean Plant Protection Organization (EPPO), the Food and Agricultural Organisation of the United Nations (FAO) — Forest Invasive Species Network for Europe and Central Asia (REUFIS), and the Austrian Research Centre for Forests (BFW).

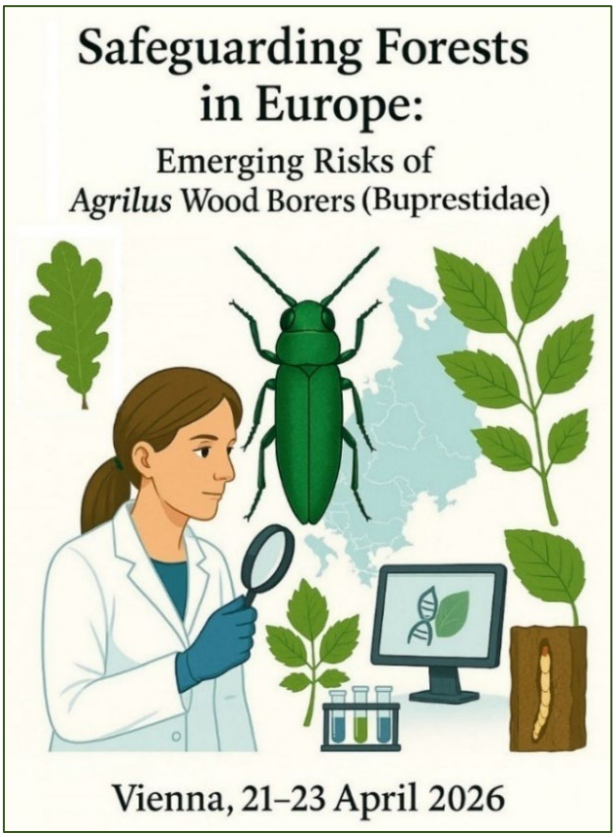
Organizers invite experts from NPPOs and academia to attend and contribute to this Conference, which will provide an important opportunity to exchange experiences and enhance preparedness for the protection of European forests against quarantine forest pests.

Focus of the Conference: The meeting will address the growing threats posed by tree-killing buprestids to Europe's forests, with a particular emphasis on:

- **the Emerald ash borer (*Agrilus planipennis*)**, native to south-east Asia, already causing devastating losses in North America and European Russia, and spreading in Ukraine and Belarus;
- **the Bronze birch borer (*Agrilus anxius*)** and the **Two-lined chestnut borer (*Agrilus bilineatus*)**, both originating from North America and posing significant risks to European ecosystems.

All elements (from biology to national systems of surveillance and control) will be covered.

Since the first Conference focused on invasive *Agrilus* held at BFW in 2018, substantial research and practical experience has been gained worldwide. This new conference will provide a platform to share knowledge, identify gaps, and strengthen strategies to safeguard European forests from these pests. Bringing together experts from native and invaded regions, the event will emphasize the interdisciplinary approach required to address quarantine species, engaging researchers, forest protection and phytosanitary specialists, administrators, and policy makers.



Link for registration: http://meeting.eppo.int/index.php/Y8948.

Up to **90 participants** may attend in person on a 'first come, first served' basis, subject to payment of the registration fee. The talks will also be **broadcast online**. To receive the conference link, please register via the same link (http://meeting.eppo.int/index.php/Y8948) and select the option for ***online attendance*** (free of charge; access limited to viewing presentations without the possibility of presenting data). The working language of the conference is English.

A QR-code of the webpage of the Conference:

17. New publication of FAO: 'Forest Pest Contingency Plan Guidelines for Europe and Central Asia' – now in Russian

In 2025, the FAO published a translation into Russian of its '***Forest Pest Contingency Plan Guidelines for Europe and Central Asia'***, that was earlier available only in English.

Pest contingency plans (PCP) are used by national or regional plant protection organizations to ensure a plan is in place for when a new pest is detected in a particular country or region, and thus to facilitate a rapid and effective response to manage the situation.

This guide outlines and discusses the elements and steps needed to formulate and implement a contingency plan for key forest pests in Europe and Central Asia. This effort is complemented by FAO's Forest Invasive Species Network for Europe and Central Asia (REUFIS), which aims to facilitate knowledge exchange, promote good practices, and build capacity related to forest invasive species, including the prevention and management of emerging pests. Suggestions are provided on the main steps, or elements, in a PCP for forest pests. The guidelines highlight the main information that should be included for a robust plan that can be activated in response to a new report of a pest or a pest outbreak, for example from official surveillance, reports from the public, or to an interception by an importing country. The report provides a step-by-step guide on developing an effective PCP tailored to specific needs. For some of the steps, examples are provided on the details that would be included for specific pests. These are (1) **the Emerald ash borer *Agrilus planipennis***, a potential insect pest introduction into parts of Europe and Central Asia; (2) the eight-toothed spruce bark beetle *Ips typographus*, native to many parts of Europe and Asia, but where outbreaks can cause substantial tree mortality; and (3) pitch canker *Fusarium circinatum*, a potential fungal pathogen introduction into parts of Europe and Central Asia. Most of the content of the guide is relevant for the development of PCPs across different regions, however, the examples provided are specific to Europe and Central Asia.

Read more:

In Russian: **Херли БП, Бугйо И, Хорват К, Винклер-Ратонйи Н, Сатьяпала Ш** (2025) Руководство по планам действий в чрезвычайных ситуациях по борьбе с вредителями леса в Европе и Центральной Азии. Будапешт, ФАО. https://doi.org/10.4060/cd2753ru

In English: **Hurley B, Buglyó I, Horváth K, Winkler-Ráthonyi N, Sathyapala S** (2024) Forest pest contingency plan guidelines for Europe and Central Asia. Budapest, FAO. https://doi.org/10.4060/cd2753en

18. New MSc theses and PhD dissertations using pests of *Fraxinus* spp. as models (with original abstracts)

Recently, eight MSc theses and PhD dissertations, in which *A. planipennis* and ash decline were used as models, were presented in Canada, Sweden, and the USA:

Davenport SW (2025) Growth, survival, and herbivore browsing preferences of seedlings planted in black ash stands of northern Michigan and Wisconsin. Open Access Master's Thesis, Michigan Technological University. Available at: https://digitalcommons.mtu.edu/etdr/1957

To mitigate the cascading ecosystem impacts of widespread black ash (*Fraxinus nigra*) mortality due to the invasive emerald ash borer (*Agrilus planipennis*), forested wetlands can be underplanted with seedlings of alternative species that later repopulate the vacated canopy. This study examined the survival and growth, factors influencing performance, and herbivore browsing preferences of seven non-ash species planted in northern Michigan and Wisconsin. The best performing species were river birch (*Betula nigra*), silver maple (*Acer saccharinum*), and swamp white oak (*Quercus bicolor*). The worst performing species was black spruce (*Picea mariana*). While maples and oaks were the most-consumed species by herbivores, browsing did not significantly affect overall performance of these species. Seedlings planted higher above the water table exhibited greatly increased chances of survival. Overall, this study identified several species that can survive and thrive under wet forest conditions, providing foresters greater opportunities for forest restoration in ash-dominated stands.

Graham ED (2025) Strategic cross-sector conservation approaches for managing Emerald ash borer (*Agilus planipennis*) invasions in Vermont. University of Vermont, Patrick Leahy Honors College Senior Theses. 694. Available at: https://scholarworks.uvm.edu/hcoltheses/694

This study highlights the critical role of cross-sector collaboration and community-based conservation in managing invasive species, with a focus on the emerald ash borer (*Agrilus planipennis*, EAB hearafter) in Vermont. Both the scope and process of my research aims to highlight a key takeaway from my academic journey as an Environmental Studies major, which 3 is that understanding complex ecological issues demands both scientific analysis and social inquiry. Drawing on a comprehensive literature review and Geographic Information

System (GIS) analysis, my thesis examines the spread and ecological impacts of EAB across the region. My methodology integrates qualitative interviews with experts in the field to evaluate the effectiveness of various mitigation techniques. These findings are complemented by an in-depth examination of local conservation initiatives and relevant case studies. By integrating these various methods, my research offers a more comprehensive perspective on the effects of EAB and the diverse, location-specific responses it has prompted. Emphasis is placed on the value of coordinated, multi-stakeholder approaches, underscoring how partnerships across public, private, and nonprofit sectors can enhance the efficacy of invasive species management. The study concludes by outlining opportunities to strengthen collaborative frameworks aimed at improving EAB response strategies and broader regional resilience to biological invasions. It also sheds valuable insights into the potential of utilizing holistic research methods that span and connect across disciplines.

Jindal V (2025) Impact of physiological and environmental variation on the behavioral response of the two biological control agents of the Emerald ash borer to host-associated odors. *LSU Master's Theses*. 6225. Available at: https://repository.lsu.edu/gradschool_theses/6225

Emerald ash borer (*Agrilus planipennis* Fairmaire; EAB) is an invasive pest that threatens ash trees (*Fraxinus* spp.) throughout North America and Europe. Since its introduction to North America, EAB has killed hundreds of millions of trees, resulting in severe ecological and economic damage exceeding 10 billion US dollars. Classical biological control involves the introduction of natural enemies from the native range of pests to manage their populations. Specialist parasitoid wasps have been released to reduce the populations of EAB. Detection and response to long-range attractants associated with EAB is critical for the location and parasitism by classical biological control agents. The ash foliage has been shown to be an important cue for the two species of *Spathius* wasps. The physiological state of parasitoids may vary across environmental conditions and has been predicted to alter host-location behaviors and biological control success. However, the impact of physiological differences on parasitoids' ability to detect and respond to host-associated cues is crucial to understanding their foraging behavior. I evaluated how adult feeding influences the survival and number of mature eggs of two species of *Spathius* wasps to optimize parasitoid release strategies. The response of wasps to attractants was tested in a four-arm olfactometer under varying physiological conditions. Wasps were fed or starved before bioassays. I validated the response of *Spathius agrili* Yang to a known attractant (green ash foliage) in a behavioral arena that had not been previously used with this species (a four-arm olfactometer). Additionally, I demonstrated that *Spathius galinae* Belokobylskij is also attracted to the foliage of green ash. Both species of *Spathius* can detect and respond to foliage from young and old green ash trees. I described the reproductive systems of *S. agrili* and *S. galinae* morphologically for the first time using fluorescent microscopy. Nutritional stress shifts their preference toward younger trees, reduces survivorship, and decreases the number of mature eggs available for oviposition. These studies contribute to classical biological control by connecting natural enemy physiology to establishment and parasitism rates across environmental gradients, making predictions about differences in the success of biological control of EAB in southeastern ecosystems, with an emphasis on subtropical Louisiana.

Koul S (2025) Development of a novel LAMP assay for early detection of two-line chestnut borer (*Agrilus bilineatus*). Master Thesis. Swedish University of Agricultural Sciences (SLU), Department of Southern Swedish Forest Research Centre, Euroforester Master's Program. Available at: https://stud.epsilon.slu.se/21754/1/koul-s%2020250930.pdf

The two-line chestnut borer (*Agrilus bilineatus*) poses a major threat to oak populations in Europe. It is a close relative to the invasive emerald ash borer (*Agrilus planipennis)*, known for its catastrophic impact on ash (*Fraxinus* spp.) forest. With increase in global trade, the threat of *A. bilineatus* spreading further into Europe is a serious concern for forest health and biosecurity. Quick and reliable molecular detection methods hence are needed to identify these pests before they get established. In this study, I aim to create a loop isothermal amplification assay for the early detection of TLCB. I have tested the assay against 24 non-target species, comprising of 16 *Agrilus* species (Buprestidae), three non-*Agrilus buprestids*, four Cerambycids, and two Curculionids. The assay was specific to the target species showing clear amplification and no amplification for all non-target species. The assay was also tested for sensitivity, and it successfully amplified DNA as low as to 0.064 pg/µL. The result demonstrates high specificity and sensitivity of the assay providing a reliable tool for early detection and can be used on-site to monitor the presence of forest pests enabling proactive management of forest pest invasions.

Land ES (2025) Optimization of somatic embryogenesis for clonal propagation of North American ash for reforestation purposes. Master Thesis. University of Georgia ProQuest Dissertations & Theses. 32113521. Available at: https://www.proquest.com/openview/1be4f76bdba1af0b3ea24f6bfc1d5b8d/1?pq-origsite=gscholar&cbl=18750&diss=y

Since 2002, the Emerald ash borer (EAB; *Agrilus planipennis*) has devastated ash populations across North America. After being detected west of the Rockies in 2022, EAB now threatens Oregon ash (*Fraxinus latifolia*) with extirpation. Clonal propagation via somatic embryogenesis (SE) offers a strategy for conserving Oregon ash germplasm and supporting restoration. This project aimed to optimize SE protocols for mass propagation by: (1) testing auxins at varied concentrations for SE induction from zygotic embryo explants; (2) evaluating auxin treatments for embryogenic culture proliferation; (3) assessing ethylene inhibitors on embryo maturation and germination; and (4) testing abscisic acid (ABA) for somatic embryo maturation. Results revealed a significant interaction between auxin concentration and cutting zygotic explants for improving embryogenesis in Oregon ash. ABA (10µM) also enhanced proliferation and maturation stages, increasing SE efficiency and somatic embryo development. These findings support refining SE protocols for reforestation of Oregon ash and other ash species threatened by EAB.

Mann AJ (2025) The fungi and bacteria associated with three tree-killing beetles: From new species to complex communities. University of Minnesota ProQuest Dissertations & Theses. 31935919.
https://www.proquest.com/openview/27c50ebcb5728985746fa667f63d5abe/1.pdf?pq-origsite=gscholar&cbl=18750&diss=y

Fungi and bacteria can play critical roles in the life cycles of bark and woodboring beetles, influencing tree colonization and, in some cases, negatively impacting tree health. This

dissertation investigates the microbial communities of two bark beetles and one woodboring beetle. The eastern larch beetle (*Dendroctonus simplex*) is a native bark beetle to North America that has undergone an unprecedented outbreak over the past two decades, impacting trees on over 90% of the tamarack (*Larix laricina*) forests within Minnesota. Prior to this work, its gallery-associated fungal communities were poorly characterized. This study demonstrated that *Grosmannia americana* is highly associated with the eastern larch beetle galleries in Minnesota. Additionally, four new species of Ophiostomatales are described and a new classification for one of the eastern larch beetle associates is proposed. The red turpentine beetle (*Dendroctonus valens*) is also a native bark beetle to North America and acts mostly as a secondary pest of pines throughout the continent, rarely killing healthy trees. A community-level analysis of the fungal and bacterial communities associated with the red turpentine beetle adults and their galleries found that red pine (*Pinus resinosa*) and white pine (*P. strobus*) host different microbial communities. Additionally, a rich diversity of Ophiostomatales were isolated from red turpentine beetle environments in the Great Lakes region, where *Leptographium terebrantis* was the most isolated species. Finally, the emerald ash borer (*Agrilus planipennis*), an invasive woodboring beetle in North America, has caused extensive damage to ash (*Fraxinus* spp.) over the past two decades, threatening an entire genus of trees. This dissertation studies how the fungal and bacterial communities in ash trees change during an emerald ash borer infestation. As the emerald ash borer attack progressed, fungal species richness declined. Additionally, most of the microbial species found in the emerald ash borer galleries were not detected in the phloem of trees without the emerald ash borer, however, the abundances of the latent microorganisms were higher in the galleries than the non-latent microorganisms. Overall, the findings in this dissertation contribute to the understanding of the fungi and bacteria associated with tree-killing beetles both on a microbial community-level and individual fungal species-level.

Primeau M (2025) Impact of the Emerald ash borer on succession and biodiversity of urban woodlands. Master Theses. Université de Montréal. Available at: https://umontreal.scholaris.ca/items/ddb5227e-0f14-4333-a529-c2349e1cd688; https://hdl.handle.net/1866/42249; https://doi.org/10.71781/330

Emerald ash borer (*Agrilus planipennis* Fairmaire) (EAB), an invasive beetle from Asia, has caused extensive mortality of ash trees (*Fraxinus* spp.) in North American forests since its detection back in 2002, leading to cascading effects on forest successional trajectories and understory composition. This study examined EAB's impacts on ash populations in urban forests, along with the resulting consequences induced on overstory and understory communities. In 2023, we resurveyed 28 forest patches (214 plots) in Montreal, Canada. These forests were first sampled in 2011, the year EAB's first detection in Montreal, providing a reference for pre-EAB conditions. We evaluated the health state and mortality in mature and sapling ashes, as well as the overstory response to ash decline. Understory changes were evaluated using species richness, cover and temporal beta diversity (TBI), with species origin considered. We found an 89% mortality rate among mature ash trees, along with increasing mortality as ash saplings grow larger. Other tree species, particularly silver maple (*Acer saccharinum*) and sugar maple (*Acer saccharum*), benefited from ash decline, resulting in a decrease in canopy openness since 2011. Furthermore, we observed a decline in understory species richness and beta diversity, driven by the loss of native species. Native species cover also decreased, while exotic species cover increased significantly, including a secondary invasion of *Rhamnus cathartica* likely facilitated by EAB's invasion. Our findings highlight the

vulnerability of urban forests to disturbances and their susceptibility to exotic species invasions, endangering native urban flora and overall forest integrity.

Singh P (2025) Integrated management of post-spread Emerald ash borer populations in urban forests. PhD Dissertation. University of Toronto, Department of Forestry. Available at: https://utoronto.scholaris.ca/server/api/core/bitstreams/b93aaa86-5835-412a-bc19-bebda69512e5/content

Emerald ash borer (*Agrilus planipennis*), known as EAB, invaded North America during the 1990s and devastated urban forests. Long-term integrated pest management (IPM) programs are essential during the post-spread phase—defined as the period after an invasive species has established itself across all suitable habitats in a landscape—to mitigate EAB damage and maintain forest canopies. However, these programs remain underdeveloped due to several factors. Among those explored in this thesis are limited understanding of EAB population dynamics in urban forests, potential incompatibility between introduced biological control agents and chemical control tactics, and insufficient knowledge of host-parasitoid interactions, particularly concerning host age. In Chapter 2, I assessed EAB population dynamics and its local habitat determinants using the long-term EAB monitoring data collected across the City of Toronto. Even 15+ years post-introduction, EAB populations remain in an outbreak population phase with local habitat features (i.e., host tree density and past EAB infestation) as significant drivers. In Chapter 3, I designed a novel laboratory bioassay to evaluate the non-target impacts of azadirachtin—a systemic, botanically-derived insecticide used in urban EAB management — on *Tetrastichus planipennisi*, an introduced EAB larval parasitoid. Exposure to azadirachtin at concentrations causing 30% and 50% mortality in EAB larvae significantly reduced the fitness of *T. planipennisi*. In Chapter 4, I determined the impact of EAB age (of both eggs and females) on the fitness of *Oobius agrili*, an introduced EAB egg parasitoid. Parasitizing older EAB eggs reduced *O. agrili* fitness, whereas maternal age influenced trade-offs among parasitism rates, immature survival, development time, and adult size. My work supports: 1) the need for continued targeted chemical treatments and EAB population monitoring in the City of Toronto to manage EAB populations and sustain its urban ash canopy, 2) strategic applications of insecticides to minimize conflicts with EAB biocontrol agents, and 3) the potential of *O. agrili* for integration into IPM programs aimed at managing EAB in urban forests. This research contributes to broader frameworks for understanding and managing invasive insect pests such as EAB that are in the post-spread invasion phase in urban forests to better support resilient urban forest ecosystems.

19. A closing remark

This concludes the content of the 9th Newsletter issue. The EPPO Secretariat welcomes submissions of comments, updates, publications, links to recent scientific papers and conference abstracts from you and your colleagues, as well as any other relevant information or announcements related to the Emerald ash borer, for circulation through future editions of the Newsletter. We also encourage readers to share information about the Newsletter with colleagues in your country and internationally. The email for correspondence is dm@eppo.int (Dmitrii Musolin).

20. References received (December 2025; with original abstracts)

Alonso Chávez V, Brown N, van den Bosch F, Parnell S, Dyke A, Hall C, Karlsdottir B, Marzano M, Morris J, O'Brien L, Williams D, Milne AE (2025) Early detection strategies for invading tree pests: Targeted surveillance and stakeholder perspectives. *Journal of Applied Ecology*, 62, 857–871. https://doi.org/10.1111/1365-2664.70009

1. Trees are at an increasing risk from pests and diseases as global trade of trees and their products increases. One of the most destructive pests found outside its native range is the emerald ash borer (*Agrilus planipennis* Fairmaire), responsible for the death of millions of ash trees in the United States, Canada, Russia and Eastern Europe. Its early detection in countries where it is not yet present is essential for effective control.

2. One of the most likely introduction pathways for emerald ash borer into Great Britain (GB) is through firewood imports from Eastern Europe, with potential spread from ports, firewood depots and households using wood-burning fires. We developed a novel modelling framework accounting for the likely invasion pathways of emerald ash borer, its population dynamics, spread and detection sensitivities to determine sampling locations that maximise the probability of detection within 2, 4 and 8 years. To provide a sociological perspective, we interviewed firewood stakeholders to understand biosecurity implications of importing and moving firewood and used scenario workshops to explore landowners' willingness to adopt early detection methods for the emerald ash borer.

3. Optimised sampling strategies significantly improve detection compared with ranked entry points (REPS) if detection resources are plentiful and optimisation targets detection within 8 years of emerald ash borer arrival. For detection within less than 4–6 years or fewer than 70 detection devices REPS are almost as effective as optimised strategies. The methods' detection sensitivity and knowledge of likely entry pathways influence the optimal spatial sampling design.

4. Firewood imports are actively inspected, and samples taken to ensure biosecurity measures are followed, but compliance at source remains uncertain. Landowners with many ash trees were more open to tree girdling, which may lead to increased detection.

5. *Synthesis and applications*: We provide the first surveillance map for emerald ash borer incursions in GB with potential for deployment by government agencies and stakeholders concerned with biosecurity. Our framework establishes optimal surveillance locations depending on factors, including detection within different timeframes, knowledge certainty of entry pathways and sensitivity of detection methods. This methodological framework is applicable to other invasive threats.

Attea GK, Vankat JL, Lloyd MC, McEwan RW (2025) The shifting mosaic in an era of anthropogenic disturbance: White-tailed deer, emerald ash borer, and decadal-scale dynamics in an old-growth beech-maple forest. *Journal of the Torrey Botanical Society*. doi: 10.3159/TORREY-D-25-00012.1;

https://jtbs.kglmeridian.com/view/journals/tbot/aop/article-10.3159-TORREY-D-25-00012.1/article-10.3159-TORREY-D-25-00012.1.xml

Old-growth temperate deciduous forests of eastern North America, although often protected from large-scale clearing, experience diffuse anthropogenic disturbances that may drive long-term dynamics. Two particularly important drivers of dynamics in these forests are overbrowsing by dense populations of white-tailed deer (*Odocoileus virginianus*) and the loss of *Fraxinus* because of the emerald ash borer (*Agrilus planipennis*). We used 41 years of vegetation data from an old-growth beech-maple forest in southwestern Ohio (USA) to analyze long-term changes. Woody plants (DBH > 1 cm) were measured and mapped in a contiguous 100 m × 105 m plot in the Hueston Woods State Nature Preserve in 1981, 1988, 1994, 2000, and during our sampling in 2022. The overstory composition and structure of the forest was relatively static from 1981 through 2000, after which there were significant changes in both structure and composition. *Acer saccharum* exhibited a significant increase in both density and basal area over the sampling interval (both $P < 0.01$), *Prunus serotina* increased in density, and *Fraxinus americana* disappeared completely from the forest canopy. In the understory we detected prominent increases in two shrub species that are deer browse-resistant – *Asimina triloba* and *Lindera benzoin*. Canopy density analysis indicated a pattern reflective of a patchy forest becoming more uniform in the 2022 sampling, which may be related to the nearly stand-wide creation of canopy gaps as *Fraxinus* was lost from the system. In summary, our data indicate canopy losses because of emerald ash borer are interacting with heavy browse pressure by white-tailed deer to shift patterns of species dominance and drive a loss of woody plant species richness in this forest preserve. Monitoring of old-growth forests through permanent plots and other long-term protocols is an increasingly pressing scientific goal in an era of intense anthropogenic disturbance.

Borsato ND, McFarlane SE, Garrett N, Biganzoli, Biganzoli-Rangel AJ, Marquina D, Steinke D, Floyd R, Clare E (2025) Factors influencing Emerald ash borer ecological interactions. BioRxiv preprint. DOI: 10.1101/2025.04.16.649187. https://www.biorxiv.org/content/biorxiv/early/2025/04/22/2025.04.16.649187.full.pdf

Emerald ash borer beetles (*Agrilus planipennis*) in North America are a destructive invasive species that increase tree mortality continent-wide, resulting in major ecological and economic impacts. Trees that are infested experience mortality rates which can exceed 99%, disrupting ecological communities and threatening the $218 billion forestry industry in North America. Given the ecological and economic impact of these pests, we seek to identify biological interactions and gain a better understanding of what ecological factors might influence these relationships. We use DNA metabarcoding from multiple markers to analyze the fungal, parasitic, plant, and microbial interactions of these beetles, and assess the relative importance of life stage (e.g., larvae, pupae, and adults), collection location, habitat, and date on the detection of ecological interactions. We detected 30 different taxonomic orders including 29 order-level interactions in larva1-stage individuals (3 animal, 17 bacteria, and 9 fungi), 64 in larva2-stage individuals (8 animal, 24 bacteria, and 32 fungi), 10 in larva3-stage individuals (2 animal, 3 bacteria, and 5 fungi), 74 in the pupae (5 animal, 31 bacteria, and 38 fungi), and 82 in the adult beetles (4 animal, 48 bacteria, 29 fungi, and 1 parasitic alveolate). These detections include several likely agents of biocontrol

including the known commercially available Beauveria fungus, and several potential parasites including Wolbachia and ichneumonid wasps. A random forest model suggests the detection of interactions is best predicted by collection date and life stage, with interactions more likely to be detected in pupal samples which may be the ideal target for future analysis, where cost and time constraints prevent the more thorough analysis of all life stages.

Callahan HL, Duan JJ, Tallamy DW (2025) Larval development and parasitism of emerald ash borer in *Chionanthus virginicus* (Oleaceae): Implications for biological control. *Environmental Entomology* 54 (5): 1096–1106. https://doi.org/10.1093/ee/nvaf077

Emerald ash borer (*Agrilus planipennis* Fairmaire) is an invasive wood-boring beetle that has killed millions of ash trees (*Fraxinus* spp.) across North America. In 2014, emerald ash borer was discovered attacking white fringetrees (*Chionanthus virginicus* L.) in Ohio, indicating a host range expansion. Since then, emerald ash borer activity in white fringetree has been confirmed in additional states, posing a potential threat to this native tree in natural and managed ecosystems. Though emerald ash borer can complete a full life cycle in white fringetree, there has been little research into the comparative success with which emerald ash borer develops in this novel host versus ash, or how introduced biocontrol agents will respond. We conducted laboratory and field infestations of white fringetree and ash in Delaware to compare the timing of emerald ash borer larval development and the associated response of larval parasitoids. In lab-infested white fringetree bolts, emerald ash borer developed slowly, with no larvae reaching the mature J-shaped larval stage (JL) during the 14-wk lab study, compared with all surviving larvae developing to the J-shaped larval stage in ash. Field results showed delayed emerald ash borer development and reduced survival in white fringetree, with just 1 larva out of 158 reaching the JL stage over 2 growing seasons. There was no parasitism of emerald ash borer larvae in lab- or field-infested white fringetree, likely because few larvae in this host reached instars suitable for larval parasitism. Overall, this study suggests that emerald ash borer populations in white fringetree are not self-sustaining, though further studies should be conducted using larger fringetree material, as small sizes may negatively impact larval survival.

Caruso V, Shirali H, Bouget C, Cerretti P, Curletti G, de Groot M, Groznik E, Gutowski JM, Pylatiuk C, Plewa R, Roques A, Salle A, Sweeney J, Van Rooyen K, Wührl L, Rassati D (2025) Image-based recognition using advanced neural networks can aid surveillance of *Agrilus* jewel beetles. ARPHA Preprints. https://doi.org/10.3897/arphapreprints.e181034

The genus *Agrilus* includes two species, *Agrilus planipennis* and *A. anxius*, that are of particular phytosanitary concern and that are regulated by the European Union legislation. This implies that phytosanitary agencies of all EU countries are obliged to establish specific surveillance programs to verify the absence of these species from their territory. These activities commonly consist of the use of green-colored traps, which are however attractive not only for *A. planipennis* and *A. anxius*, but also for a wide range of other *Agrilus* species. For this reason, much time and expertise is required to sort and identify specimens to species, impeding an efficient rapid response. In this study, we tested the efficacy of the Entomoscope, a low-cost, open-source photomicroscope that uses high-resolution digital imaging and allows a pre-

trained Convolutional Neural Networks (CNN) model to accurately detect, image and classify insect specimens, for automatic identification of 13 *Agrilus* species, including *A. planipennis* and *A. anxius*. We benchmarked models from three different CNN architectures and selected YOLOv8l as the most robust performer; this model achieved a Top-1 accuracy of 90.2% on a "real-world" test set (i.e. a dataset simulating real surveillance conditions). For most species, including *A. planipennis* and *A. anxius*, either no errors or only a few errors were made, whereas for a few native species misidentifications were more common. These results provided proof of concept for an AI-driven surveillance system that can strongly aid in surveillance activities of *Agrilus* species.

Dang Y, Wei K, Dai X, Wang X (2025) Exploration of winter diapause stages of the emerald ash borer based on morphological and biochemical parameters. *Journal of Insect Physiology* 165: 104859. https://doi.org/10.1016/j.jinsphys.2025.104859

Diapause enables the critical survival of certain insects under adverse conditions, and the concealment ability of insects makes characterizing diapause traits challenging. Here, we focused on the invasive emerald ash borer (EAB, *Agrilus planipennis*), a species with obligatory winter diapause, and combined morphological, physiological, and biochemical analyses to correlate overwintering diapause stages with two pupal chamber forms: J-shaped (JL) and I-shaped (IL) larvae. Fourth-instar larvae (L4, nondiapausing, still feeding) outside the chamber and pupae (postdiapausing) inside the chamber served as controls. The results revealed that 1) the JL and IL periods overlapped, lasting up to 7 and 5 months, respectively. Significant variations in physiological–biochemical parameters during JL prompted its subdivision into three substages: early (JL-E), middle (JL-M), and late (JL-L). 2) Compared with L4-stage insects, insects in the JL-E and/or JL-M stages presented significantly lower juvenile hormone (JH), trehalose, glucose, and inositol amounts, whereas the 20-hydroxyecdysone (20E) and glycerol amounts increased significantly. In the JL-L and IL stages, the amounts of JH, trehalose, glucose, and inositol no longer differed from those in L4. The IL-stage insects ultimately developed into pupae, with JH, glycerol, and inositol amounts comparable to those in the pupal stage. These findings demonstrate that the JL and IL stages in *A. planipennis* exhibit strong temporal correspondence with distinct diapause phases, as evidenced by their characteristic physiological signatures. This field-based multilevel study improves the understanding of the diapause biology of this invasive insect pest.

Dearborn KW, Inward DJG, Smith SM, MacQuarrie CJK (2025) *Fraxinus* foliage: does host species during adult maturation feeding alter the fecundity of emerald ash borers, *Agrilus planipennis* Fairmaire (Coleoptera: Buprestidae)? *Environmental Entomology* 54 (3): 593-602. https://doi.org/10.1093/ee/nvaf018

Herbivorous insects can have their reproductive potential influenced by the quality and species of host plants they feed upon. The emerald ash borer (EAB), *Agrilus planipennis* Fairmaire (Coleoptera: Buprestidae), is an invasive pest of ash trees (*Fraxinus* spp.) within its introduced range. As adults, EAB must feed upon foliage to sexually mature. We compared the influence of 4 North American ash species on EAB via foliage feeding to assess impacts on female lifespan and reproductive metrics. We fed 136 female EAB, 34 in each foliage group, either black, green, tropical, or white

ash throughout their adult life. We performed daily inspections for adult mortality, oviposition, and egg hatching. We found that the mean female lifespan, fertility rate, and mean egg development time were not affected by the ash species. Potential and realized fecundity each increased with summed female group lifespan (days), but this rate differed among ash species. Consequently, there was a statistically significant interaction effect of the summed female group lifespan and the host foliage. Green ash-fed EAB laid (2.94 ± 0.86 eggs/female days) and hatched (1.67 ± 0.59 eggs/female days) the most eggs, more than double the rates of EAB feeding on black (1.39 ± 0.48 laid and 0.75 ± 0.30 hatched eggs/female days) and white (1.08 ± 0.35 laid and 0.65 ± 0.22 hatched eggs/female days) ash. Adults feeding on green ash resulted in the greatest EAB fecundity suggesting that the presence of green ash may promote population growth and provide a pathway to overwhelm other ash species nearby.

Green MA, Barnes BF, Gandhi KJK, Pienaar EF (2025) Examining park users' support for emerald ash borer (*Agrilus planipennis*) control in urban parks. *Conservation Science and Practice* 7(5), e70018. https://doi.org/10.1111/csp2.70018

Emerald ash borer (*Agrilus planipennis* Fairmare (sic!); EAB) is a woodboring beetle that is considered one of the most damaging invasive forest insects in North America, causing near-complete mortality of native ash (*Fraxinus* spp.) trees across multiple states. Management options include both biological control using parasitoid wasps from EAB's native range, and chemical control with systemic insecticides. Although both strategies are being used to control EAB, the public's support for these methods is not well understood. In 2023, we surveyed 174 urban park users in northeastern Georgia, United States, to identify determinants of their support for EAB control. Most respondents were not previously aware of EAB and ash trees, although they valued the ecosystem services provided by park trees. Respondents were more supportive of biological control than chemical control, perceiving greater ecological and human well-being risks from chemical control. Respondents' risk perceptions pertaining to control methods and EAB, and their attitudes towards ash trees influenced their support for EAB control. Birdwatchers were less likely to support chemical control and individuals who like to sit and enjoy nature were more likely to support biological control. Our results suggest that park managers' outreach about EAB control should emphasize the aesthetic appeal and ecosystem services provided by urban ash trees and the invasion impacts of EAB. Outreach should also highlight that EAB control does not pose ecological or human well-being risks, that parasitoid wasps help to secure ecosystem function through pest control and do not pose a risk to people, and that EAB control will not adversely impact recreational activities within the park.

Green MA, Duan JJ (2025) Effect of pore size and gap width of artificial oviposition substrates on the egg-laying behavior in *Agrilus planipennis*: Implications for larval host selection. *J Insect Behav* 38, 19. https://doi.org/10.1007/s10905-025-09883-0

Phytophagous insects select for oviposition sites that improve offspring survival outcomes. Many woodboring insects, such as the invasive emerald ash borer (EAB), *Agrilus planipennis*, select for oviposition sites underneath bark crevices of host trees. Although the preference for rougher bark has been demonstrated, the limits of EAB oviposition site selection are unknown. Here we determined the effective bark crevice size that EAB females oviposit under through trials with coffee filter paper covered

with mesh screening in a no-choice experiment. We then conducted a choice experiment where we wrapped an ash log with polypropylene ribbons at different tightness treatments as oviposition stimulants. We found that EAB females oviposited onto coffee filter paper through mesh pores ranging from 0.6 × 0.6 mm (0.36 mm^2) to 1.4 × 1.4 mm (1.96 mm^2), but not 0.2 × 0.2 mm (0.04 mm^2). The width of ovipositors on a sample of 30 EAB females ranged from 0.270 to 0.689 mm, suggesting the smallest pores prevented ovipositor insertion. Females also oviposited more on logs wrapped with ribbon at a moderate gap width (0.5 mm) than on logs with loose gaps (1 mm) or logs with tight gaps (0.06 mm), which was smaller than our measured ovipositor widths. Our findings suggest that female EAB prefer gap sizes that are relatively tight so long as they are large enough to allow insertion of the ovipositor. These results have implications for larval host selection in field settings as the attribute of bark crevices limiting EAB oviposition may vary drastically with host plant.

Green MA, Duan JJ, Crandall RS, Van Driesche RG, Martinez A, Andersen JC, Elkinton JS (2025) Ash survival and growth in response to emerald ash borer invasion in Massachusetts riparian forests: Impacts of biological control. Forest Ecology and Management 594, 122951. https://doi.org/10.1016/j.foreco.2025.122951

The emerald ash borer (*Agrilus planipennis*, EAB) is an invasive buprestid that currently threatens North America's native ash (*Fraxinus* spp.) resource, particularly green ash (*F. pennsylvanica*), a species that is common in riparian ecosystems and floodplain forests. Loss of ash has widespread implications for the ecosystem services these habitats provide. Biological control, through the introduction of hymenopteran parasitoids from EAB's native range in Northeast Asia, is a potential long-term management solution; however, it is unknown if the program can protect mature ash trees that often succumb to the initial wave of EAB invasion. We here assess the ash growth and mortality responses to EAB invasion at six floodplain forests in Massachusetts and the impacts of early releases of biological control agents. We released the parasitoids *Oobius agrili*, *Spathius galinae*, and *Tetrastichus planipennisi* at three sites from 2017 to 2022. From 2018–2024, we measured the diameter at breast height and assessed the canopy condition of approximately 100 tagged ash trees at each site plus three non-release sites. We found significant effects of site and initial crown dieback on ash tree growth. We also found that the percent ash mortality was negatively correlated to the level of parasitism of EAB larvae in sentinel ash bolts deployed across the six study sites in 2024. This is the first finding of a relationship between EAB larval parasitism and ash health outcomes in the literature. Future work could examine if these results extend to different habitats and environments.

Hartmann H, Battisti A, Brockerhoff EG, Bełka M, Hurling R, Jactel H, Oliva J, Rousselet J, Terhonen E, Ylioja T, ..., Fischer R (2025) European forests are under increasing pressure from global change-driven invasions and accelerating epidemics by insects and diseases. *Journal für Kulturpflanzen* 77 (2): 6–24. https://doi.org/10.5073/JfK.2025.02.02

Rising temperatures attributed to anthropogenic climate change have held a firm grip on European forests for over two decades now and disturbances have increased substantially, mainly from insects and pathogens. Empirical evidence suggests a direct linkage between rising temperatures and increasing damage from native insects. Although the rapid spread of non-native invasive pests and pathogens is mainly driven

by globalized trade and lacking tree species adaptation to locally new threats, climate change favors rapid range expansion of some invasive pests. Here, we present some examples of tree-insect-pathogen interactions in native and non-native systems that have experienced climate change-induced severe outbreak dynamics. We document the spread of damaging insects and pathogens into previously climatically unsuitable regions and underscore the severe forest damages such species distribution shifts can cause. Although systematic assessments are still pending, the information provided here by multiple independent empirical evidences is highly valuable for identifying some of the most pressing issues in European forest protection. Our work can guide forest protection agencies in preparing mitigating strategies for upcoming decades.

Higgins H, D'Amato AW, Siegert NW (2025) Effects of harvest treatments anticipating emerald ash borer invasion on northern hardwood forests in New England, USA. Forest Ecology and Management 588, 122748. https://doi.org/10.1016/j.foreco.2025.122748

Management practices reacting to a present or encroaching non-native forest pest can have different and sometimes greater impacts than the pest itself. The emerald ash borer, *Agrilus planipennis* (EAB), has emerged as one of the most destructive invaders in North America, and management responses have shifted as EAB's invasive range has rapidly expanded over the past several decades. In response to the EAB invasion, forest management practices including pre-salvage logging and strategies to improve ash regeneration (*Fraxinus* spp.) have been implemented to meet economic, ecological, cultural, and safety objectives. Although studies have indicated landowners, foresters, and loggers are changing their management practices because of EAB, less is known about the realized ecological impacts of forest management in response to this pest. In summer 2020, we measured forest structure and composition at sites across New England, USA, that included white ash harvests (*F. americana*) motivated by the threat of EAB impacts. In the overstory, we found a lower proportion of white ash basal area in harvested study sites compared to unharvested control sites. However, white ash regeneration at the seedling and sapling stages was higher in harvested than in unharvested plots. EAB presence or proximity did not have a significant effect on overstory composition or ash health in our stands at the time of data collection. Our findings indicate that forest management practices that align with ash species' silvics, such as the greater light availability needed to successfully recruit new white ash cohorts, can bolster ash regeneration and perpetual presence in New England forests. Although EAB remains a significant threat, our work confirms the importance of promoting ash regeneration, supported by recent findings that ash survival and resistance to EAB is more prevalent, and more variable, than previously thought. This work will help inform future management decisions in response to this invasive pest that ensure long-term ecological and economic options are maintained on site.

Kazi IM, Ryss AY, Popovichev BG, Selikhovkin AV (2025) Formation of the invasive range of the Emerald ash borer *Agrilus planipennis* in St. Petersburg, Russia: Developmental characteristic, peculiarities and associated nematodes. *Biology Bulletin* 52: 304. DOI: 10.1134/S1062359025610468

Emerald ash borer *Agrilus planipennis* was previously detected in St. Petersburg in 2020, and this paper presents an update of the situation. In 202 4, the presence of seven active outbreaks was observed. In Nevsky District an area very remote from the

other known finding sites was detected, close to the south-eastern border of the city. Earlier, in Nevsky District, a hotspot of infestation was detected in Park Stroiteley, after which the trees were designated for felling. Three new foci were identified in Petrodvortsovy District. In previous years, two more infested areas were detected – in the ash alley plantings on Suvorovskaya Street, buildings 5 and 7, as well as in the railway station square in Lomonosov. These findings were fixed in 2022 – in the eastern part of Saint Petersburg and Petrodvortsovy District at a distance of 0.5–3 km from the southern coast of the Gulf of Finland; the western and south-western part of the Nevsky District close to the Neva River (approximately 750–1000 m). Complete removal of infested ash trees in this district was not carried out. Nematodes, both bacteriophage (*Panagrolaimus* sp.), mycophytotrophs and plant parasites (*Laimaphelenchus* sp.), were found in the emerald ash borer larval galleries, but not in the imagoes and larvae themselves. Presumably, the nematodes do not use the emerald ash borer as a vector, but were transmitted by other insects or entered the ash trunks by another means. Both species of ash trees, *Fraxinus excelsior* and *Fraxinus pennsylvanica*, were observed to be infested. The density of settlements of the infested trees was at a low level, and a significant increase in larval mortality was noted compared findings in 2019–2020. Further factors restraining the population density may be an increase in the number of parasitoids, low heat availability, and timely removal of infested trees. The increase in the number of ash borer outbreaks suggests that the spread of this pest is continuing and can lead to massive death of ash trees in St. Petersburg.

Kovalenko N, Pospielova G, Pysarenko V, Hibolenko I (2025) Emerald ash borer (*Agrilus planipennis*) as a potentially dangerous quarantine pest of Ukraine's dendroflora. *Scientific Progress & Innovations* 28 (3): 85–90. DOI: 10.31210/spi2025.28.03.14 (in Ukrainian, with English abstract)

The aim of this review is to consolidate current knowledge on the biology and distribution of the emerald ash borer (*Agrilus planipennis*), assess its impact on ash species, and analyze the expansion of this quarantine phytophagous pest's range in Ukraine. The spread of invasive insects is one of the most pressing challenges in modern forestry, as it leads to biodiversity loss, reduced stability, and decreased productivity of forest stands. The emerald ash borer (*Agrilus planipennis* Fairmaire) is considered particularly dangerous due to its rapid colonization of new territories and severe damage to ash plantations. To minimize risks and prevent large-scale outbreaks, a set of preventive measures has been developed, focusing on early detection and containment of the pest. A key element of this strategy is the identification of infested areas and the implementation of systematic population monitoring. For this purpose, colored (purple, green) and pheromone traps are used, installed at well-lit forest edges at a density of one trap per 5 hectares before the expected flight of adults. Infestation diagnosis is carried out by removing bark to detect larval galleries, which allows timely confirmation of colonization. Affected trees should be promptly removed through selective or clear sanitary fellings during the autumn–winter period, followed by wood disposal. Preventive measures also include temporary restriction of large-scale ash plantations and the establishment of optimally dense stands, which enhances ecosystem resilience. An important component of biological control is the preservation and attraction of entomophagous species, particularly insectivorous birds such as

woodpeckers, which effectively prey on larvae and pupae during overwintering. In regions where *A. planipennis* has not yet been detected, monitoring surveys are conducted to identify new invasions and assess potential risks of expansion. The findings have practical significance for improving monitoring systems and preventive strategies against hazardous pests, preserving biodiversity, and ensuring the ecological stability of forest ecosystems.

Kupper Q, Peterson DL, Fritsi LC, Hölling D, Perret-Gentil A, Pecori F, Altenbach D, Giulio, Zbinden H, Schneider S, Ruffner B (2025) An enhanced qPCR method for rapid *Agrilus planipennis* detection and monitoring. *NeoBiota* 103, 53–67. https://doi.org/10.3897/neobiota.103.163040

Emerald ash borer (EAB; *Agrilus planipennis*) represents a serious threat to North American and European ash species (*Fraxinus* spp.). Spread of EAB westwards, from European Russia and Eastern Ukraine, could lead to dramatic consequences for native European ash populations. Early detection is essential for fast and successful eradication of new populations. In this study, we developed a new TaqMan qPCR assay allowing for sensitive and specific detection of EAB. We tested the specificity of the assay against 17 European *Agrilus* spp., eight buprestid species and nine species belonging to other wood-associated beetle taxa. The qPCR assay provided reliable amplification from samples with DNA concentrations as low as 0.5 picograms per reaction. Moreover, DNA could be amplified from different sample types, such as egg casings, leaves, faeces and bore dust from larval galleries. Robustness of the assay was verified by performing a blind test with four different laboratories. Here we provide a highly specific, robust and sensitive assay which can be used for enhanced surveillance of *Agrilus planipennis* on the European continent.

Larson CE, Solomon KJ, Sabat-Bonilla SA, Roon DA (2025) Implications of forest insect pest outbreaks for riparian–stream ecosystems. *Freshwater Science* 44 (3): 378-390. https://www.journals.uchicago.edu/doi/full/10.1086/736778

Forest insect pest outbreaks (FIPOs) are an increasingly widespread disturbance in forested ecosystems, yet their effects on riparian–stream ecosystems are still not well understood. Here, we synthesized current knowledge on typical headwater stream responses to FIPOs, focusing on 4 key forest insect pest (FIP) species in North America: hemlock woolly adelgid (*Adelges tsugae* [Annand, 1924]), emerald ash borer (*Agrilus planipennis* Fairmaire, 1888), spongy moth (*Lymantria dispar dispar* [Linnaeus, 1758]), and mountain pine beetle (*Dendroctonus ponderosae* Hopkins, 1902). FIPOs lead to immediate impacts on headwater streams, including shifted invertebrate subsidies, altered detrital inputs, decreased canopy cover, increased light availability, and increased algal standing crop. In the post-outbreak stream response, FIP life history (i.e., foliage feeder, sap feeder, or borer), host-tree distribution (random, clumped, or extensive and uniform), and vegetation reestablishment (similar, less, or more canopy cover) influence long-term impacts on stream ecosystems. Streams may return to baseline conditions or experience long-term shifts, including changes in light availability, algal standing crop, and stream hydrology. These effects appear to vary among FIP species and geographic location, suggesting that effects are frequently context dependent and highlighting the need for further research to understand the implications of FIPOs on riparian–stream ecosystems.

Le Souchu E, Sallé A, Bankhead-Dronnet S, Laparie M, Sauvard D (2025) Intra- and interspecific variations in flight performance of oak-associated Agrilinae (Coleoptera: Buprestidae) using computerized flight mills. *Peer Community Journal* 5: e64. https://peercommunityjournal.org/articles/10.24072/pcjournal.560/

Several Agrilinae species (Coleoptera: Buprestidae) are thermophilous forest borers, and some are also major invasive pests. They are expected to be favoured by climate change and the global deterioration of forest health, and expand their range and damage. Flight behaviour and performance of these insects are poorly known despite their critical role in dispersal and their relevance to management. This study aimed to assess intra- and interspecific variability in active flight of several Agrilinae species and effects of sex and mass on this variability. We assessed the flight performance of eleven oak-associated species (nine *Agrilus*, one *Coraebus*, one *Meliboeus*) plus one herb-associated *Agrilus*. Computer-monitored flight mills were used to measure flight parameters of 250 beetles. Overall, flight capacities were rather homogeneous among species, with a dominance of poor flyers and only *Coraebus undatus* showed outstanding performance. Beetles generally performed several short flight bouts within one trial, and only a few individuals sustained long flight. The maximal total distance covered across multiple assays until death ranged from 170 to 16 097 m, with a median between 35 and 966 m (excluding individuals that never flew). Add to this interspecific variability, flight distances varied greatly among individuals, but were not influenced by sex. Preflight body mass had mixed effects depending on the species, presumably related to dispersal patterns. In our experimental conditions, most species had limited average dispersal capacities over multiple flight trials. Overall, long-distance dispersal and colonisation events probably depend on a small proportion of individuals which largely exceeded the median performance.

Li E, Luo H, Cui X, Liu K, Dong W (2025) Future climate change promotes the global threat of the emerald ash borer (*Agrilus planipennis* Fairmaire) to ash species. *J Plant Ecol* 18:rtaf091. https://doi.org/10.1093/jpe/rtaf091

Rising global temperatures are significantly affecting species distributions worldwide. Properly assessing the threat of invasive species in the context of global warming is crucial. In this study, we quantitatively assessed the potential threat of emerald ash borer (EAB) against global ash tree species (*Fraxinus*) under multiple future climate scenarios based on the premise of niche conservatism. Through a multidimensional comparison of overlapping distribution areas and niches forecasted by species distribution modeling, we observed that rising temperatures lead to significant shifts in the habitat ranges of both EABs and *Fraxinus* species, often resulting in increased overlap of both their suitable habitats and niches. These results indicate that global warming, across most climate scenarios, exacerbates the threat of biological invasions by EABs in all main distribution regions. This study highlights the critical importance of considering both invasive species and their potential hosts in predictive modeling. Additionally, our results establish a well-theoretical foundation for future research and management strategies aimed at protecting vulnerable ecosystems from the expansion of invasive species.

Li J, Yan B, Song H, Yang M (2025) The complete mitochondrial genome of *Agrilus zanthoxylumi* Li, 1989 (Buprestidae: Agrilinae): Genome characterization and phylogenetic implications. *Journal of the Entomological Research Society* 27 (1): 121—138 https://www.entomol.org/journal/index.php/JERS/article/view/2756/2537

Few mitogenomes sequences are available for *Agrilus* species in the family Buprestidae. To explore the mitochondrial genome features and their phylogenetic relationships, the complete mitogenome of the trunk borer jewel beetle, *Agrilus zanthoxylumi*, Li, 1989 (花椒窄吉丁), an important invasive pest of Chinese prickly ash (*Zanthoxylum bungeanum* Maxim.) in China, was sequenced and annotated. The complete 16,320 bp genome encodes 37 mitochondrial genes, including 13 protein-coding genes (PCGs), 22 transfer RNA (tRNA) genes, 2 ribosomal RNA genes, and a 1526-bp-long AT-rich region. Most of the PCGs, except ND1 which uses TTG had typical ATN start codons, and terminated with TAA/TAG or a single T residue. In addition, UUA (Leu2), UCU (Ser2), CGA (Arg), and GGA (Gly) were the four most frequently used codons. All tRNAs were folded into a secondary cloverleaf structure, except for tRNASer, which lacks the DHU arm. The analysis of the nonsynonymous and synonymous substitution rates of PCGs showed that a strong purifying and negative selection exists in those buprestid beetles. Phylogenetic analyses within the subfamily Agrilinae (including *Agrilus planipennis*) were performed using concatenation methods based on multiple matrices from mitochondrial genes. The phylogenetic results indicated that *A. zanthoxylumi* is clustered with other species of *Agrilus*. All phylogenetic trees supported the monophyly of Agrilinae and Trachini, but the tribal relationship in Agrilinae remains ambiguous.

Mann AJ, Mogouong JT, Showlater DN, Held BW, Bushley KE, Blanchette RA (2025) Does Emerald ash borer infestation alter ash phloem microbial communities over time? *Phytobiomes Journal* (in press). https://doi.org/10.1094/PBIOMES-06-25-0046-R

The emerald ash borer (EAB), *Agrilus planipennis*, is a destructive invasive insect of North American ash (*Fraxinus*). While microorganisms associated with the beetle may contribute to tree decline and death, the microbial community succession during an EAB attack is unknown. We repeatedly sampled the bottom two meters of green ash (*Fraxinus pennsylvanica*) and black ash (*Fraxinus nigra*) in seven stands across an infestation gradient over four years. Amplicon libraries were sequenced from control phloem tissue of trees showing no symptoms of infestation, uninfested phloem of trees with EAB, infested phloem (galleries), frass, and larvae to determine if there are shifts in the fungal and bacterial communities as trees succumb to EAB attack. We found that the control phloem communities significantly differed from the beetle-infested phloem in both tree species. Furthermore, as EAB progressed in its attack from the top limbs to the tree's base, the microbial communities in uninfested phloem outside the galleries shifted away from communities in phloem of control trees. In infested phloem, more than 80% of the detected taxa were absent from control trees (i.e., most taxa were non-latent). However, the relative abundance of latent taxa in infested phloem was higher than the relative abundance of the non-latent taxa, especially for potential canker-causing fungi, which increased 21-fold and 32-fold in black ash and green ash trees, respectively. These findings provide valuable insight into how a woodboring beetle shapes the microbial environment within trees over time,

influencing the overall microbial diversity, such as canker-causing and wood decay taxa.

Mathieu RDR, McCullough DG (2025) Long-term survival and radial growth of four North American and two Asian ash species in a common garden exposed to emerald ash borer invasion. *Environmental Entomology* 54 (3): 603–614, https://doi.org/10.1093/ee/nvaf049

Four North American and one Asian ash species were planted in 2007 in 30 complete randomized blocks in a common garden in Ingham County, Michigan USA to evaluate host resistance and preference of emerald ash borer (EAB) (*Agrilus planipennis* Fairmaire), first detected in this area in 2003. Trees were protected from EAB colonization until 2012. We recorded current-year woodpecker holes and EAB adult exits on live trees annually from 2017 to 2022. Annual radial growth was quantified on increment cores from live trees and cross-sections from EAB-killed trees. Every *Fraxinus nigra* was killed by EAB by 2013. By August 2022, 63% of *F. pennsylvanica*, 12% of *F. americana* and 86% of *F. chinensis* trees had died. In contrast, *F. quadrangulata* trees were minimally colonized and remained healthy through 2022. Average (± SE) annual increment from 2007—2021 ranged from 2.65 ± 0.18 mm for *F. quadrangulata* to 4.61 ± 0.46 mm for *F. chinensis*. In an adjacent plantation planted in 2010, we assessed size, growth and EAB signs in 2022 on 12 live *F. pennsylvanica* and 12 Asian *F. mandshurica*. All *F. mandshurica* remained healthy with little evidence of EAB injury. Despite heavy EAB infestation, *F. pennsylvanica* radial growth in 2011 to 2022 remained relatively high. Results show *F. nigra* is highly preferred and vulnerable to EAB, followed by *F. pennsylvanica*, while *F. americana* is an intermediate host and *F. quadrangulata* is resistant. Of the 2 Asian species, *F. mandshurica* was resistant to EAB but *F. chinensis* trees were heavily colonized and most died.

Mazurchuk H, Puzrina N, Vasylyshyn R, Bala O, Karpuk A, Melnyk O, Khan Y, Chemerys A, Babych Y (2025) Investigation of ash stands' health condition in emerald ash borer (*Agrilus planipennis* Fairmaire) infestation: Case study in Holosiivskyi District, Kyiv, Ukraine. *Ecological Engineering & Environmental Technology* 26(12). https://www.ecoeet.com/Investigation-of-ash-stands-health-condition-in-emerald-ash-borer-Agrilus-planipennis,214362,0,2.html

The aim of this study is to comprehensively assess the health condition of ash stands in Holosiivskyi National Nature Park, Kyiv, and identify the main biotic and abiotic factors contributing to stand decline, determining damage distribution patterns and the role of individual factors in stand degradation. Field observations were conducted during the peak growing season to ensure accurate assessment of tree health parameters. This research demonstrates the complex interactions between invasive and stem pests, fungal and bacterial pathogens, and abiotic factors in ash stand degradation. Research was conducted in 2023—2024, combining forest pathological surveys, identification sample collection (n>110), stand assessment by health condition classes, and pest monitoring using pheromone and color-based traps with D-shaped exit hole counts. The weighted average health condition index (HCI = 3.82) indicates severe stand damage and high proportions of dying trees. Most studied trees exhibited dead branches and symptoms of decline. Healthy trees (health class I) comprised only 7%, while declining or dead trees (health classes IV–VI) accounted for over 57%. Trees with 48–88 cm diameters showed the highest vulnerability. Stem pest emergence rates

were: *Agrilus planipennis* – 1.1 ± 0.2 holes/dm², *Hylesinus crenatus* – 2.7 ± 1.3, *Hylesinus fraxini* – 2.2 ± 1.3. Root rot and epicormic shoots were widespread, indicating intensive stress factor impacts. The most common damage combination was "rot + stem pests" (4.0 ± 1.72%), particularly in roadside stands. Results demonstrate that critical health conditions result from complex interactions among *A. planipennis*, stem pests, and fungal and bacterial pathogens, particularly affecting larger-diameter trees.

Nowakowska J, Słowik J, Pacia A, Tereba A, Marozau A, Borowik P, Oszako T (2025) Interplay between genetic diversity and tree vitality in *Fraxinus excelsior* populations affected by ash dieback. *Genes* 16: 1087. https://doi.org/10.3390/genes16091087

Background: Ash dieback, driven by the invasive fungal pathogen *Hymenoscyphus fraxineus*, has precipitated severe declines in *Fraxinus excelsior* L. populations across Europe, threatening genetic diversity and ecosystem stability.

Methods: This study investigates the interplay between phenotypic vitality and genetic variation in five Polish ash stands using nuclear simple sequence repeat (nSSR) and chloroplast DNA (cpDNA)markers. Vitality assessments of 186 trees across three reserves (from Białowieza Primeval Forest and Wolica Reserve) were conducted.

Results: Vitality assessments revealed a slight predominance of dying individuals (36%, 3rd degree of Roloff classification). Nuclear analyses indicated moderate to high diversity (mean HE = 0.826), significant inbreeding (FIS = 0.178, $p < 0.001$), and low inter-population differentiation (FST = 0.044) among all five stands. Chloroplast markers showed elevated differentiation (ΦST = 0.228, $p < 0.0001$), reflecting phylogeographic structure. Vitality degrees assessed in three chosen populations (Browsk FD, Hajnowka FD, and Chojnow FD) exhibited negligible genetic differentiation (nSSR FST = 0.009; cpDNA ΦST = 0.003), suggesting gene flow mitigates pathogen-induced selection. Bayesian clustering (STRUCTURE, K = 3) revealed admixture with distinct genotypes in dying trees, potentially linked to susceptibility.

Conclusions: These findings underscore the resilience of ash genetic pools and advocate for selective breeding in nurseries to prevent the spread of dieback, prioritizing resistant genotypes for conservation.

Peters CJ, Rajtar NN, Blanchette RA (2025) Entomopathogenic fungi from Minnesota are virulent against Emerald ash borer, *Agrilus planipennis* Fairmaire (Coleoptera: Buprestidae), adults in a laboratory autodissemination device assay. *Forests* 16: 1742. https://doi.org/10.3390/f16111742

The emerald ash borer (EAB; *Agrilus planipennis* Fairmaire) is a deadly pest of ash trees (*Fraxinus* spp.) in North America. Chemical and biological control methods are already in use against EAB, but additional integrated pest management (IPM) strategies are needed to reduce EAB populations in remote, northerly forests on the edge of the infestation front, such as those in northern Minnesota, USA. One entomopathogenic fungus (EPF) isolate, *Beauveria bassiana* (Bals.-Criv) Vuill. CFL-A, deployed in autodissemination devices (ADDs) has previously shown promise in reducing EAB population growth. Additionally, EPF has been found to be associated with EAB in Minnesota. This study assessed the suitability of ten Minnesota-indigenous, and one commercial, EPF strains for potential use in ADDs targeting EAB adults. Fungal isolates spanned five genera, including *Beauveria*, *Purpureocillium*, *Metarhizium*,

Clonostachys, and *Samsoniella*. Of those tested, *Beauveria pseudobassiana* S.A. Rehner and Humber EAB 16.8, *Beauveria bassiana* GHA, *Metarhizium* sp. Meta, and *Purpureocillium* sp. EAB 59-16-2 consistently reduced the mean survival time (MST) and probability of survival over time for EAB adults dropped into an EPF-containing ADD in the laboratory. Furthermore, these fungi were readily recovered from surface-sterilized EAB cadavers. Future ADD field trials using these isolates are warranted to validate their ability to reduce EAB population growth.

Pinchevska O, Horbachova O, Bardarov N, Zavialov D, Davydov V, Oliynyk R (2025). Properties of heat-treated ash wood. *Ukrainian Journal of Forest and Wood Science* 16(2), 25—41. https://doi.org/10.31548/forest/2.2025.25

Ash wood is characterised by high mechanical and technological properties and has a beautiful texture, which leads to a high demand for furniture and joinery products made from it. However, the widespread and rapid spread of the fungal disease *Hymenoscyphus fraxineus* (chalar necrosis) and the invasive beetle *Agrilus planipennis* caused massive dieback of ash trees. All of this led to the transformation of healthy wood during one year into low-quality "deadwood" and limited its use in industry. The objective of the research was to investigate specific properties of ash deadwood subjected to sterilisation through high-temperature treatment using various thermal regimes. To renew its use, it is proposed to use sterilisation without the addition of chemicals by thermal modification at temperatures of 185 °C (schedule 1) and 195 °C (schedule 2), which does not impair the environmental properties of wood. The physical, mechanical, and technological properties of heat-treated 'deadwood' ash and healthy wood dried at a temperature of t ≤ 70 °C were studied. It has been determined that the equilibrium moisture content of heat-treated 'deadwood' ash wood decreased by 3.5—4.0% compared to healthy wood; the density at actual moisture and in a completely dry state decreased by 8—12% and by 4—9%, shrinkage in the transverse direction by 53—67%; the bending strength decreased by only 6% in the case of schedule 1 and by 20% in the case of schedule 2. The static hardness in both the tangential and radial directions had an unexpected trend – an increase of 9—12% when using schedule 1 and a decrease of 1.7—13% when treated by schedule 2. The weight loss of samples of heat-treated 'deadwood' ash wood was 60—90% less than the weight loss of healthy wood. The accuracy factor of all experimental studies did not exceed 5%. The results obtained make it possible to effectively choose the use of heat-treated 'deadwood' ash wood under schedule 1 in joinery and furniture products, and treated under schedule 2 in furniture products such as tabletops, as there is a decrease in the relevant mechanical properties. The use of both treatment modes allows the use of low-cost ash wood in products that are used outdoors.

Potyondy PJ (2025) Minneapolis street tree planting guidelines to increase diversity. Arboriculture & Urban Forestry: 1—6. https://doi.org/10.48044/jauf.2025.033

The threat and eventual loss of ash trees (*Fraxinus*) to emerald ash borer (*Agrilus planipennis*) in Minneapolis, MN, USA, was a major opportunity to establish a more diverse and resilient public street tree population. This generational opportunity was embraced. With the goal of increasing urban forest resiliency against future pests and conditions, Minneapolis developed and applied multiscaled tree selection guidelines to systematically select and plant a diverse mix of trees. Within a relatively short amount

of urban forest time, the diversity of the Minneapolis public street tree population greatly increased. Within the past two decades, the number of genera that make up 1% or more of the public street tree population has nearly doubled. Before the guidelines, maple (*Acer*) comprised 30% of the public street tree population. Currently, there are no genera that comprise 20% or more of the public street tree population in Minneapolis. As a result of the guidelines, there is more diversity across the whole city, within neighborhoods, and along individual street block segments. The benefits of this diversification will hopefully lessen the exposure to and impact of future urban forest pests and

Puzrina N, Bala O, Boiko H, Sovakov O, Nosenko Y (2025) Infestation of ash emerald ash borer *Agrilus planipennis* Fairmaire, (Coleoptera: Buprestidae) on the territory of National University of Life and Environmental Sciences (NULES) of Ukraine. Ukrainian Journal of Forest and Wood Science 16 (1): 8—22. https://doi.org/10.31548/forest/1.2025.08

The aim of the study was to assess the sanitary condition of ash trees of the genus *Fraxinus* spp. on the territory of NULES of Ukraine and to monitor the number of invasive species *Agrilus planipennis*. The inventory data of 2021—2023 were presented, where it was noted that the condition of 66% of ash trees was characterised as good. A detailed survey in 2024 revealed a rapid deterioration of ash trees throughout the study area. It was found that a significant weakening of *Fraxinus* spp. trees was noted on the territory of the Botanical Garden of the National University of Life Sciences of Ukraine and near the stadium. It was worth noting that 13% of trees without signs of damage were located in the depths of the forest, as the emerald ash borer was a potential feeder for trees growing openly, although with a significant distribution the insect can inhabit trees in the depths of the plantation. During the detailed forest pathology survey, *Agrilus planipennis* adults and D-shaped flight holes were found. The number of typical D-shaped flight holes per 1 dm2 was calculated to determine the density of settlement and production of young beetles. The maximum number of exit holes per 1 dm2 was 4.2 ± 1.8, so with an average number of exit holes of 1–2.4 per 1 dm2, 35 to 100% of the trees inhabited by the moth could dry out within 2—3 seasons. To determine the number and distribution of *Agrilus planipennis* adults, pheromone traps' surveys with artificially synthesised pheromone and traps without pheromone to attract insects by colour were conducted. According to the results of the counts, it was found that adults of *Agrilus planipennis* were presented only in traps with artificially synthesised pheromones.

Rizzo D, Gionni A, Pecori F, Zubieta CG, Marrucci A, Moriconi M, Ranaldi C, Palmigiano B, Bartoli L, … Luchi N (2025) Novel *Agrilus planipennis* early-detection tooldesigned on Cytochrome B gene. Preprint. https://doi.org/10.21203/rs.3.rs-7980969/v1

Agrilus planipennis is a quarantine pest that is threatening native ash populations in both North America and Europe. Early detection of this pest, which can cause severe infestations, is essential, and molecular tests applied at different developmental stages and environmental traces can contribute substantially to improving control measures to prevent or contain A. *planipennis* infestations. In this study, a specific *A. planipennis* real-time qPCR assay was developed using a Locked Nucleic Acid (LNA) probe based on theCytB (Cytochrome B) gene. The detection limit of this method was 25.6 fg/µl for adult DNA extracts and 0.21 pg/µl for frassproduced by *A. planipennis*

larvae. The new qPCR probe test, which targets a different locus, not only allows identification of the pest and provides an indirect diagnosis through environmental DNA analysis but can also be used for cross-validation of results between different tests.

Rizzo D, Pecori F, Moriconi M, Zubieta CG, Palmigiano B, Bartolini L, Downes A, Ranaldi C, Papini V, Luchi N, Santini A (2025) Molecular identification of *Agrilus anxius* (Coleoptera: Buprestidae) using a qPCR assay with locked nucleic acid (LNA) probe. *J Appl Entomol* 149: 757—768. https://doi.org/10.1111/jen.13423

In the present study, a biomolecular diagnostic assay based on qPCR-LNA (Locked Nucleic Acid) probes was developed for the identification of *Agrilus anxius* (Coleoptera: Buprestidae) from adult insects. The performance of the new protocol was also evaluated for indirect diagnosis of the insect's presence on artificially contaminated frass. The designed primer and probe were able to distinguish in silico all *A. anxius* samples from nontarget species, with a 100% match with homologous sequences found in GenBank databases. The molecular assay was sensitive, specific and repeatable. The analytical sensitivity (limit of detection—LoD) for *A. anxius* adults and artificially contaminated frass was 6.4 fg/μL and 0.08 pg/μL, respectively. This assay, by analysing eDNA samples, will allow the insect's early detection in an area before it has caused major impact. eDNA analysis is becoming an increasingly used tool in the spatial survey programs of phytosanitary services and could play a decisive role in pest surveillance.

Sambaraju KR, Powell KA, Beaudoin A (2025) Multi-model assessments to characterize occurrences of emerald ash borer (Coleoptera: Buprestidae), *Journal of Insect Science* 25 (3): 18, https://doi.org/10.1093/jisesa/ieaf032

Introduction and spread of nonindigenous species present a formidable threat to forest health. The emerald ash borer (EAB), *Agrilus planipennis*, is an East Asian-origin insect that has devastated ash (*Fraxinus* spp.) trees across the United States and parts of Canada since 2002. Proactive surveillance using high-performing predictive models could aid in mitigating pest risk. Predictor variables and modeling methods are important considerations in such analysis. Therefore, we assessed whether relevant single predictors, a combination of predictors grouped under a certain driver category, or multiple key predictors comprising several drivers, alter the goodness-of-fit of logistic regression models to EAB occurrence data (2002 to 2018) from Canada. The predictors used in models included spatial, topographic/positional, transport pathways/human hotspots, host-related factors, and climate-related variables. Using predictors from the best candidate logistic regression model, we tested the performance of 7 different model types including an ensemble model. Our findings showed that predictors from a wide range of drivers better characterized EAB occurrences than single predictors or a combination of predictors from any given driver category. In multi-model comparisons, random forest outperformed all other models, including the ensemble model. Elevation, infestation pressure, accumulated degree-days (>10 °C), and human population density were important predictors of EAB presence. Random forest and ensemble model forecasts for the city of Edmonton, Alberta, Canada, indicated an area of potential concern for EAB. Our research strongly underscores the utility of comparative multi-model approaches in invasive risk

assessments that could have important implications for pest surveillance and management.

Sidelnikov VA (2025) Succession of forest ecosystems of the Voronezh Region: Analysis and qualitative assessment of processes. In: Yakovenko TM (ED). Adapting Forestry to Climate Change: Nature-Based Solutions and Digitalization. Forestry–2024: Proceedings of the International Forestry Forum, Youth Section, Voronezh, 31 October – 1 November 2024. P. 174—178. (in Russian, with English abstract). https://doi.org/10.58168/FFYS2024

This article is dedicated to the study of succession processes in the forest ecosystems of the Voronezh region, focusing on the dynamics of changes in tree species composition. Special attention is given to the decline of ash (*Fraxinus excelsior*) due to the impact of the emerald ash borer (*Agrilus planipennis*), the slowed growth of oak (*Quercus robur*) due to the species' biological characteristics, and the rapid spread of maple (*Acer* spp.), which is taking over the newly available territories. The current trends are analyzed, the causes of the observed changes are identified, and their potential consequences for the region's forest ecosystems are discussed. The results obtained can be used to develop measures for managing succession and preserving forest biodiversity.

Strygun O, Chumak P, Anol O, Kivel Y., Tkachova S (2025) Features of monitoring *Agrilus planipennis* (Coleoptera: Buprestidae) in urbocenoses of megapolis. *Fitosanitarna Bezpeka* 71: 234-248 (in Ukrainian with English summary) https://zkr.ipp.gov.ua/index.php/journal/article/view/262

Goal. Monitoring the phytosanitary condition of ash trees growing in parks, squares and botanical gardens of Kyiv, Boryspil, and Glyboky village in order to detect the beetle *Agrilus planipennis* (Fairm.) and improve methods for its detection in urban ecosystems.

Methods. Field — monitoring of invader detection, route surveys of ash trees. The studies were conducted in the laboratory of entomology and resistance of agricultural crops to pests of the Institute of Plant Protection of the NAAS and in botanical gardens, parks and squares of Kyiv and the region.

Results. When monitoring plants of the genus *Fraxinus* L. in ash plantations in 2022—2025, it was found that not all methods known in forestry for detecting the invader *Agrilus planipennis* can be unconditionally used in the conditions of the megalopolis coenoses. Certain methods for detecting the pest have been tested and improved. Species, varieties and forms of ash trees that are damaged by *Agrilus planipennis* (*Fraxinus. excelsior* var. *aureovariegata* Weston; *F. excelsior* var. *aureovariegata* Weston; *F. angustifolia* subsp. *oxycarpa* (M. Bieb. ex Willd.) Franco & Rocha; *F. pennsylvanica* Marshall; *F. profunda* (Bush) Bush; *F. angustifolia subsp. siriaca* (Boiss) Yalt.; *F. sogdiana* Bunge) and are tolerant to this beetle (*F. excelsior* var. *excelsior*, 'Crispa', 'Heterophylla Pendula', *F.* 'Aurea', 'Nana'; *F. chinensis* subsp. *syriaca* (Boiss.) Yalt; *F. pallisiae*).

Conclusions. Methods for detecting the invader *Agrilus planipennis* (Fairm.) in the conditions of the forest ecosystem cannot be used in the urban environment for the most part. For the purpose of initial detection of the pest, it is necessary to use sticky traps for this species. To detect D-shaped holes at the top of the trunk, binoculars and

a smartphone with megapixel resolution should be used, during the period when the trees are not covered with leaves. It has been established that removing damaged tree tops only delays the spread of the pest for 3—4 years, and cutting damaged plants to the stump and treating healthy plants growing nearby with biological insecticides contributes to the improvement of the biotope as a whole. Plants should be urgently removed if the following signs appear: drying of the tops, peeling of small areas of bark (woodpeckers' activity) and the formation of water shoots on the trunk. The results obtained have practical significance for monitoring the quarantine invader in urban environments, which contributes to the stabilization of its phytosanitary status.

Thurman LL, Rudnick DA (2025) Management brief: managing the threat of Emerald ash borer invasion in a changing climate. https://hdl.handle.net/1773/54147

In June 2022, the emerald ash borer (*Agrilus planipennis*; 'EAB') was discovered in Forest Grove, OR, marking its first appearance west of the Rocky Mountains. Forest managers fear for the future of Oregon ash (*Fraxinus latifolia*) and at least 8 other tree species found only in western North America. Climate change may broaden the threat of EAB invasion and will require climate-smart, proactive management to sustain healthy forests.

Usacheva RV (2025) Genetic potential as a basis for breeding resistant common ash trees (*Fraxinus excelsior*). In: A. T. Eprintsev (ed.). Organization and Regulation of Physiological and Biochemical Processes. 27. Voronezh: Scientific Book Publishing and Printing Center. Pp. 217—223 (in Russian).

Common ash is one of the most valuable broadleaf tree species in the European part of Russia and has proven to be susceptible to infestation by the invasive emerald ash borer (*Agrilus planipennis*). A group of researchers studying ash trees resistant to the borer identified genes that control the synthesis of defensive compounds. Using this approach, ash populations can be conserved through interspecific hybridization, genome editing, and selective breeding to develop ash trees resistant to the emerald ash borer.

Volodchenko AN (2025) Expansion of the range of the ash borer (*Agrilus planipennis* Fairmaire, 1888) in the south-east of the European part of Russia. *Izvestia Sankt-Peterburgskoj Lesotehniceskoj Akademii* 254: 112—124 (in Russian with English summary). https://izvestiya-lta.spbftu.ru/jour/article/view/550

The emerald ash borer (*Agrilus planipennis*) is a dangerous pest of ash trees (*Fraxinus* spp.) in the northern hemisphere. The data are presented on the current distribution of *A. planipennis* on the southeastern border of the invasive range in the European part of Russia. From 2021 to 2024 route surveys of plantings and forest stands were carried out with the participation of *F. excelsior* and *F. pennsylvanica* on the territory of the Tambov, Penza, Voronezh, Saratov and Volgograd regions. At the end of 2024, the distribution covered the whole Voronezh region, a significant part of the east of the Tambov region, the western and central parts of the Saratov region, the northwestern part of the Volgograd region, the Bekovo and Serdobsk districts of the

Penza region and the city of Penza. Both the gradual spread of the pest and the formation of enclaves outside the main territory of the invasive range are observed.

The rapid spread of *A. planipennis* and the formation of isolated foci of mass reproduction are associated with unintentional dispersal by humans via road and rail transport. The primary targets of pest attack are ash forests near roads and railways, railway junctions and stations, and automobile terminals. *A. planipennis* colonizes both ash species growing in the area, with a clear preference for *F. pennsylvanica*. The successful advancement of the pest is facilitated by the widespread use of ash trees in forestry and landscaping. Natural forests with *F. excelsior* located inside the territories of mass reproduction began to be noticeably affected by the pest only in 2023—2024. That was several years after the dieback of *F. pennsylvanica* stands. Active penetration of the pest into the territory of the Nature Reserve 'Khopersky' and the Reserve 'Ramonye' (the Voronezh Region) is noted.

Zhang B, Koski T-M, Wang H, Chen Z, Li H, Mogouong J, Bushley KE, Xing L, Sun J (2025), The role of phenylpropanoids and the plant microbiome in defences of ash trees against invasive emerald ash borer. *Plant, Cell & Environment*, 48: 5680—5698. https://doi.org/10.1111/pce.15534

Plants have coevolved with herbivorous insects for millions of years, resulting in variation in resistance both within and between species. Using a manipulative experiment combined with untargeted metabolomics, microbiome sequencing and transcriptomics approaches, we investigated the roles of plant metabolites and the microbiome in defence mechanisms in native resistant Manchurian ash (*Fraxinus mandshurica*) trees and non-native susceptible velvet ash (*Fraxinus velutina*) trees against the highly invasive emerald ash borer (EAB, *Agrilus planipennis*). Comparative transcriptomics and metabolomics analyses show that the phenylpropanoid pathway, which is enriched in differentially expressed genes and differentially abundant metabolites, may serve as a potential regulator of resistance. Additionally, the microbiome is distinctly shifted in two ash species. Indicator taxa analysis reveals that the distinct genera are dominant in the galleries of two ash species, for example, *Pseudomonas* in velvet, and *Hafnia-Obesumbacterium* in Manchurian. The strong correlation between indicator taxa and metabolites suggests that the chemical compounds might impact the microbial community in phloem directly or indirectly, or vice versa. This study significantly enhances our understanding of the variation in resistance between ash species and its contribution to the invasion success of EAB, providing valuable insights for the development of pest management strategies.

Zhang S, Hu X-R, Zhao J-W, Zhou J-T, Sattar A, Xin B (2025) Analysis of key factors affecting the population dynamics of *Agrilus planipennis* on two host plants. *Forest Research* 38: 1—9 (in Chinese with English summary) doi: 10.12403/j.1001-1498.20240498. https://journals.caf.ac.cn/article/doi/10.12403/j.1001-1498.20240498

Objective. To identify the key factors influencing the population of *Agrilus planipennis* Fairmaire (Emerald ash borer, EAB) on *Fraxinus sogdiana* Bunge and *Fraxinus americana* Linn., and to clarify the effects of host plants on the population dynamics and developmental trends of *A. planipennis*.

Methods. Life tables were constructed for both the natural and experimental populations of *A. planipennis* on *F. sogdiana* and *F. americana* by tracing method and caging method conducted between 2023 and 2024, respectively.

Results. The key factor influencing the population density of *A. planipennis* on the two host plants was the oviposition rate of adult females, which was significantly higher on *F. americana* than on *F. sogdiana* (natural population: df=1, 36, t=−2.921, P=0.016; experimental population: df=1, 16, t=−4.066, P<0.001). The population trend index of *A. planipennis* on *F. americana* was greater than 1 (Inp=5.232 2, Iep=19.489 0), while it was less than 1 on *F. sogdiana* is (Inp=0.101 0, Iep=0.257 3). The key factor influencing the population dynamics of *A. planipennis* natural population was S. agrili Yang (*F. sogdiana* EIPC=1.432 5, *F. americana* EIPC=1.774 9), followed by *Dendrocopos* spp. (*F. sogdiana* EIPC=1.177 7, *F. americana* EIPC=1.203 4). In the experimental populations, the key factor influencing the population dynamics of *A. planipennis* was unhatching due to unsuccessful incubation of the egg stage (*F.sogdiana* EIPC=1.157 1, *F. americana* EIPC=1.147 6). Notably, host plant immunity had no significant effect on the population dynamics of *A. planipennis* larvae.

Conclusion. The egg-laying preference of *A. planipennis* adults is a key factor influencing the population density differences between the two host plants, and natural enemies have a significant impact on the population dynamics of *A. planipennis* population as well.

Zhu G, Ragozzino M, Holthouse MC, Mills M, Celis JL, Johnson S, Crowder DW (2025) Ecological niche modeling and potential dispersal of emerald ash borer in the Pacific Northwest. *Journal of Economic Entomology* 118 (5): 2404—2411, https://doi.org/10.1093/jee/toaf175

The emerald ash borer, *Agrilus planipennis* Fairmire (sic!) (Coleoptera: Buprestidae), is a notorious invasive pest that can devastate ash trees, *Fraxinus* spp. L., and embedded communities. While emerald ash borer is established in eastern North America, it was recently detected in Forest Grove, Oregon and in Vancouver, British Columbia, raising concerns that it may spread across the Pacific Northwest riparian ecosystems dominated by ash. A quarantine zone has been established in Oregon, but future mitigation depends on assessing the spread to new regions. Here, we used habitat suitability models and dispersal simulations to predict the potential spread of emerald ash borer. Specifically, we compared climate spaces occupied by Oregon and British Columbia populations with other native and introduced populations, and then used habitat suitability models and dispersal simulations to predict future distributions. We show that the newly established Oregon and British Columbia populations currently occupy relatively narrow climate niche, and many suitable niche spaces are unoccupied in the Pacific Northwest, indicating potential for range expansion. We also show there are vast areas of suitable habitat that extend south of the present quarantine zone throughout inland western Oregon and north into Washington. In Vancouver, the most suitable habitat was found along the Fraser River, where emerald ash borer could disperse inland. Dispersal models suggest that, without intervention, emerald ash borer could disperse into Washington within 2 yr, throughout western Oregon in 15 yr, and reach California in 20 yr. Our work supports intensive quarantine efforts for emerald ash borer and identifies areas where monitoring and management efforts should focus.

Zviagintsev VB, Kirichenko NI, Chernik MI, Seraya LG, Baranchikov YN (2025) The Emerald ash borer *Agrilus planipennis* Fairmaire (Coleoptera: Buprestidae) invaded Belarus. *Acta Biologica Sibirica* 11: 847–861. https://doi.org/10.5281/zenodo.16744135

The emerald ash borer, *Agrilus planipennis* Fairmaire, 1888 (Coleoptera: Buprestidae), is a harmful East Asian insect pest damaging ash trees *Fraxinus* spp. Over the past three decades, it has invaded European part of Russia and Ukraine, causing widespread mortality of ash trees in both urban and natural ecosystems. Here, we report first occurrence of this devastating pest in Belarus, specifically in the city of Gomel. During reconnaissance survey performed in the late June 2025, a total of 46 ash trees, including 39 *Fraxinus pennsylvanica* and 7 *F. excelsior* trees, displayed characteristic symptoms of infestation: canopy dieback, epicormic sprouting, and distinct D-shaped exit holes in the bark. A single larva of the IV instar was found within a typical gallery beneath the bark, and 13 adult beetles mating and feeding on the foliage of both ash species were recorded. Given the proximity of infested regions in neighboring countries — specifically Bryansk (243 km away from Gomel) and Smolensk (270 km) in Russia, as well as Kiev (220 km) in Ukraine — it is suspected that the buprestid was accidentally introduced from some of these localities rather than expanding its range by itself. Urgent research is required to delineate the extent of its spread within Belarus. Moreover, decisive actions must be taken promptly to suppress current infestation foci and prevent further distribution of this highly aggressive alien pest.